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FARM TYPES IN NEBRASKA, AS DETERMINED BY CLIMATIC, SOIL, AND ECONOMIC FACTORS

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Contents

Farm Types in Nebraska, as Determined by Climatic, Soil, and Economic Factors

by

R. R. Spafford

INTRODUCTION

This bulletin treats chiefly of Nebraska agricultural areas as determined by climatic, soil, and economic factors. Most of the subject matter centers about the kind of farm crops grown and their yields. Cultural practices applied to crops are only incidentally considered. Most of the data used are from the Thirteenth Census of the United States and cover the crop year 1909. The small amount of data not derived from this source comes largely from field studies in this State and is used merely to support certain methods of treating census data.

To make the basis of the analysis of Nebraska agricultural areas more stable, it has been necessary to follow thruout the northern hemisphere some of the very general principles in regard to climate, soil, plants, and people. Furthermore, it has been necessary to place the crop groups (based on the classification of annual crops) of Nebraska in line with those of the United States as a whole and to extend the size-of-farm study thruout the Great Plains region.

Crop-group belts are determined largely by the quantity of heat received and in general extend from east to west. The size of farm in the Great Plains is determined largely by rainfall and serves as a good index to the quantity of field crop and pasture growth. The general trend of any given size-of-farm belt in this region is from north to south. The fact that crop-group belts and size-of-farm belts in Nebraska tend to run at right angles to one another makes it a relatively simple matter to block out areas that have a fairly uniform type of farming. In determining the boundaries of type areas, soils are not ignored. Extreme conditions of texture and topography de-

termine certain types and subtypes. The Sand Hill and Level Loess areas in this State serve as illustrations. For each type area the type of farm, as it existed in 1909, has been calculated. The facts concerning the various farm types have been grouped about as follows:

1. Size of farm.
2. Use of land.
   - Crop groups.
   - Total yields.
   - Yields per acre.
   - Value of plant growth.
   - Crop indexes.
3. Live stock.
   - Kinds.
   - Productive stock.
   - Work animals.
   - Live-stock returns.
4. Labor.
5. Capital.
6. Classes of operators.

The principal object of this work is to correlate in a measured way a number of important facts concerning farm types. The work, it will be seen, is by no means final. The material prepared during short intervals in the past two years is published here simply as a progress report.

THE OUTLINE OF AGRICULTURAL REGIONS IN THE NORTHERN HEMISPHERE

North America has two large agricultural regions. One of these regions centers in Washington, Oregon, and California, and the other in the eastern part of the United States and southern Canada. Eurasia also has two such regions similarly located. One is occupied in part by Great Britian, France, Germany, Austria, and east-central Russia, and the other in part by China Proper, Manchuria, and Japan. The climate of each of these regions is to a large extent determined by the westerly winds.* Land located along western coasts receives the westerlies fresh from the ocean while that located along eastern coasts receives these winds only after they have crossed more or less of the interior of the land mass.

Climate within the belt of the westerlies ranges from oceanic to continental. Naturally the truest types of oceanic climate in this belt of winds are found on western coasts.

*The climate of southeastern North America and Eurasia is to an extent affected by the trade winds.

Eastern coasts have what may be classed as an oceanic climate, but it is not as equable as that of western coasts. The extreme continental climate is common to the interior of North America and Eurasia. In contrast with an oceanic climate, a continental climate is variable. Temperature changes are more sudden and extreme. Rainfall is comparatively lighter and when it comes it is apt to be torrential rather than steady. Also when snow falls the ground is seldom covered with a uniform blanket. In general it can be stated that the climates found on similar sides of North America and Eurasia are more comparable than those found on adjacent sides. This is to a less extent true of points in the interior.

The boundaries of the four great agricultural regions in the northern hemisphere are determined by low temperature, low rainfall, and coast lines. In southern Canada, Norway, Sweden, and Finland, and in northern Russia, Manchuria and Japan, agriculture is limited by low temperature. The principal agricultural boundaries determined by low rainfall in North America are found (1) in the states of the Great Plains and (2) in the states of the Pacific coast region. In Eurasia the principal agricultural boundaries determined by low rainfall are found (1) in southeastern Russia and (2) in western China Proper and Manchuria. Figures 1, 2, and 3 indicate in a diagrammatic way these agricultural boundaries. The small circles mark temperature limits, and the dashes rainfall limits.

The northern parts of the two agricultural regions in both land masses are connected by a strip of marginal agricultural country lying between a cold adverse region to the north and a dry adverse region to the south. This is roughly indicated in the figures by a line made up of both circles and dashes. It is possible that these strips of country are determined by the fact that to the south higher temperature makes droughts very destructive while to the north the lack of heat during the growing season soon comes to act as an absolute limit to ordinary agriculture.

Soil has but little visible effect upon the boundaries of these agricultural regions. Considered on any large geo-

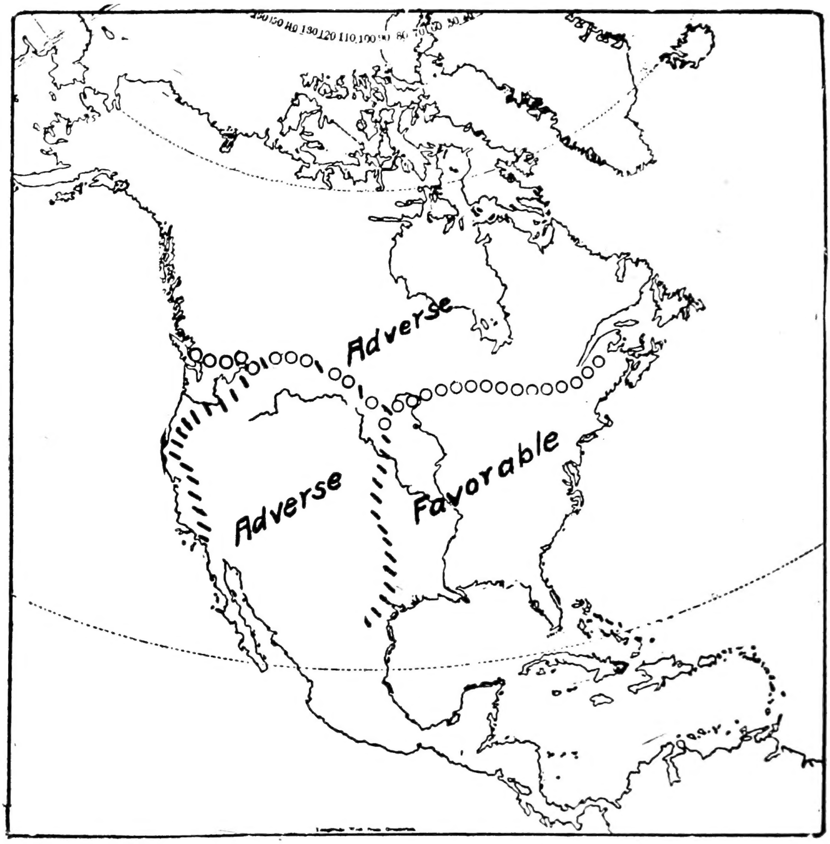

Fig. 1.—The principal boundaries of the agricultural regions of North America. The small circles mark temperature limits and the dashes rainfall limits.

graphical scale, soil effects are often submerged by climate. The reverse, however, is true within any comparatively small area of agricultural land. Here variations in soil often have sufficient range to outweigh the relatively small range of climatic variations.

The location of the favorable agricultural lands with reference to the distribution of native vegetation is striking. The low temperature boundaries are closely marked by the southern limits of the northern coniferous forests while the low rainfall boundaries are marked by a sparse vegetation

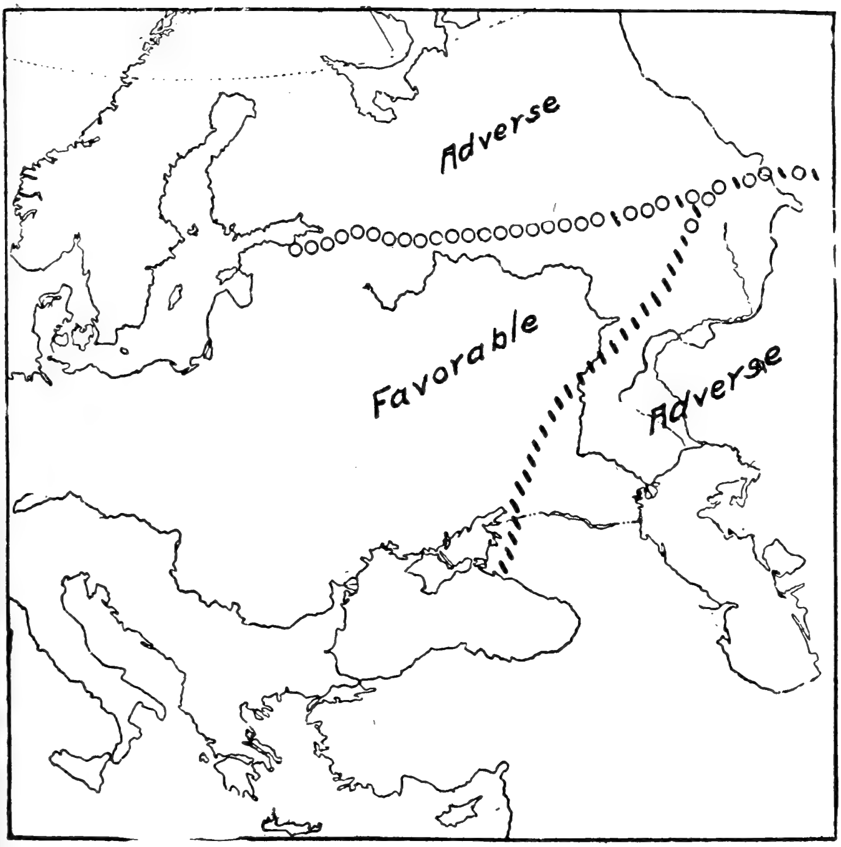

Fig. 2.—The principal boundaries of the agricultural region of Europe. The small circles mark temperature limits and the dashes rainfall limits.

characteristic of semidesert regions. Within the favorable region one finds most of the broad-leaved forests and good growths of temperate grasses.

Figures 4, 5, and 6 illustrate the relative importance of soil, rainfall, and heat in various parts of any great agricultural region. The curved surface of a figure represents the great divisions of substance and the plane surface a few of the greater forces that are important to plants. Man, of course, is actively concerned with only such factors as happen to fall low enough to hinder him in maintaining his

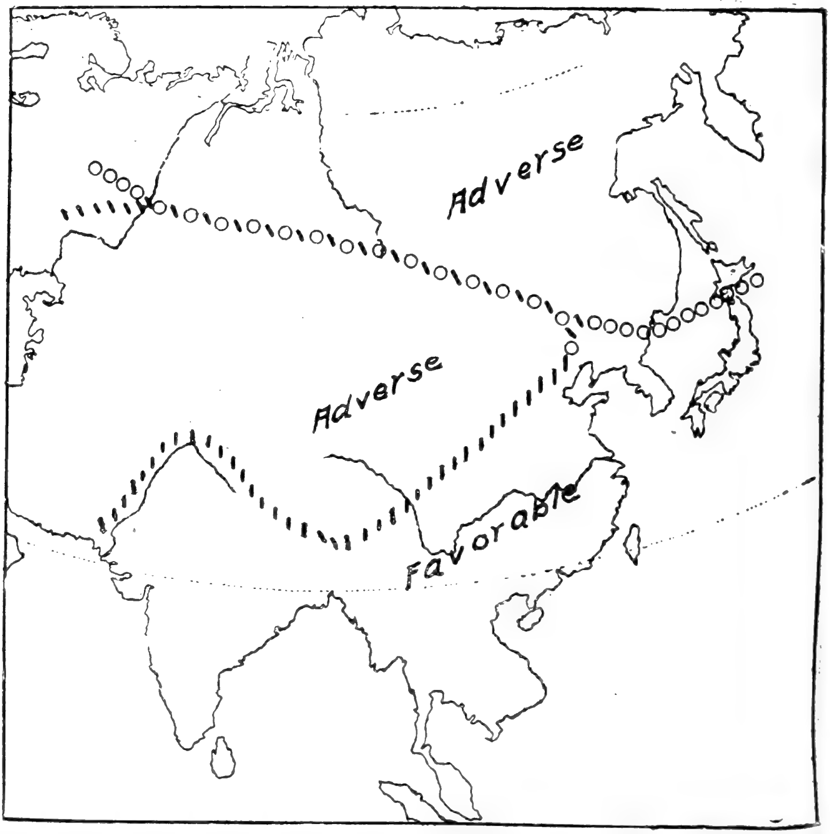

Fig. 3.—The principal boundaries of the agricultural region of Asia. The small circles mark temperature limits and the dashes rainfall limits.

bodily comfort. These figures indicate why it is that farmers living well within favorable regions give a great deal of attention to soil problems, while those in the northern border areas are more interested in cold evasive and cold resistant crops; and again in dry border areas interest turns to problems of irrigation, drought evasion and drought resistance.

Of the people living in North America and Eurasia, 90 to 95 per cent are located within the favorable regions. To the north scarcity of food and the difficulty of maintaining a comfortable bodily temperature act as checks to immigration. Along low rainfall boundaries the principal check is the

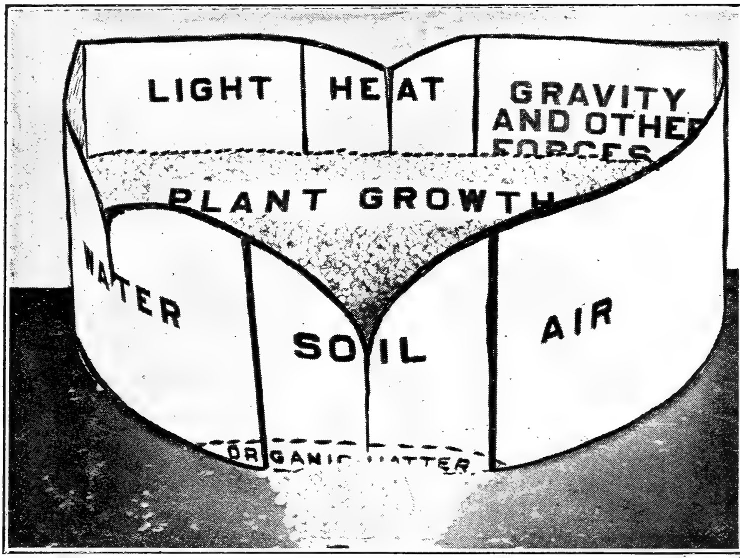

Fig. 4.—Soil the limiting factor within favorable agricultural regions.

the difficulty of obtaining food. It may be added in connection with these statements that our inability to control bodily temperature is one of the chief hindrances to a successful intensive tropical agriculture.

From the foregoing discussion it can easily be seen that Nebraska data will bear heavily upon moisture problems such as are common to areas near the center of the Great Plains. Altitude in the extreme western part of the State adds to what would otherwise be a short scale in heat differences. As concerns soil, there is almost a complete scale in both texture and topography.

THE EFFECT OF HEAT UPON THE ACREAGE OF CROPS TREATED AS ANNUALS*

A CLASSIFICATION OF FIELD CROPS

Most field crops can be classified as either annuals, biennials, or perennials. In field practice biennial crops have no

*For a number of the ideas presented in this division of the bulletin the author is indebted to Professor E. Hopt, formerly in charge of Field Crops instruction in the College of Agriculture, University of Nebraska.

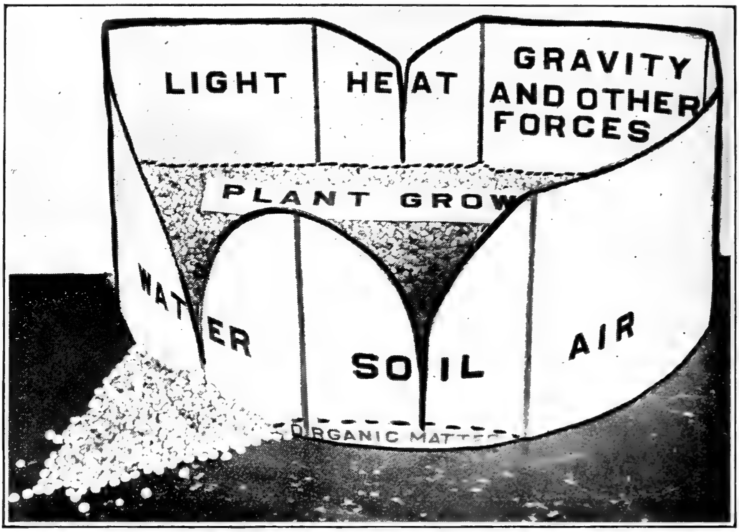

Fig. 5.—Water the limiting factor in border regions determined by rainfall.

well-defined place of their own. In some cases they are treated as annuals and in other cases as perennials. This being the case, one is justified in saying that, in general, there are but two large divisions of field crops, one division treated as annuals and the other as perennials.

Crops treated as annuals divide into three groups commonly spoken of as fall or winter annuals, spring annuals, and summer annuals. Winter annuals are usually seeded in the fall, live thru the winter, bear fruit and die the following summer. Spring annuals are seeded either in the late winter or during the spring and are harvested in the summer or early fall. Summer annuals are planted either in the late spring or early summer and are harvested during the fall and early winter.

This part of the bulletin deals principally with the acreage of the various field crops listed in the census that are treated as cultivated annuals. It appears that the variation in the acreage of the three groups of crops belonging to this division affords one of the best possible measures of the effect

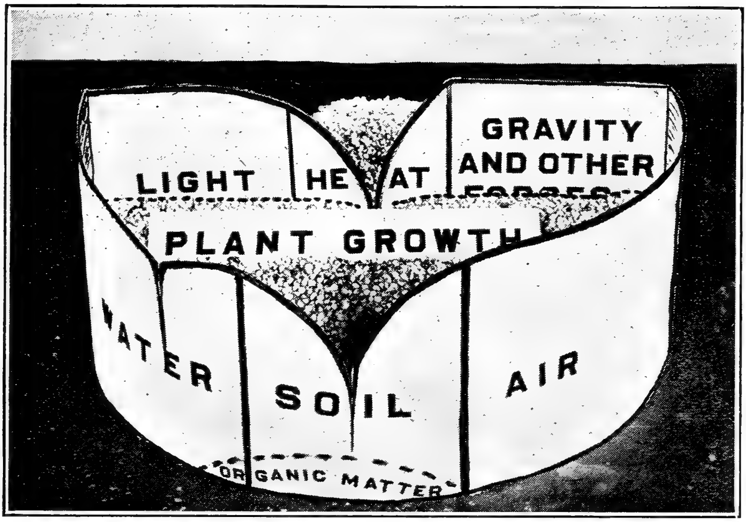

Fig. 6.—Heat the limiting factor in border regions determined by low temperature.

of heat upon farming. The crops treated as annuals are present in nearly every county in the United States and usually occupy the greater part of the cultivated land. These points are very essential where large-scale measurements are to be made.

While it is true that the acreage of cultivated crops treated as perennials is affected by heat it is also true that the effect of heat upon the acreage of perennials is often outweighed by rainfall, soil, and economic conditions. This together with the fact that cultivated perennials are scarcely represented in a large number of counties in the United States makes them almost useless in the measurement of what are more purely heat effects.

The census makes no attempt to keep winter, spring, and summer annuals separated from one another. This grouping of crops in the census made it necessary in some cases to use estimates, and in other cases supplementary data. The following outline will give an idea of how the census material was treated before beginning the study of heat in its relation

to farming. There may be a number of serious and valid objections to the classification of certain crops in the spring and summer annual groups. The outline simply shows the order in which the census material was organized for this particular study.

A. Cultivated crops treated as annuals.

1. Winter annuals. (Cold tolerant but heat sensitive.)
   - a. Winter wheat (supplementary data used).
   - b. Rye. (The acreage of rye given in the census was treated as winter rather than spring. This of course causes error in counties growing spring rye, but this error is seldom sufficient to affect materially any broad classification of farming regions.)

2. Spring annuals, together with such summer annuals as are favored by cool weather and have a relatively short growing season. (Cold tolerant but heat sensitive.)
   - a. Spring wheat (supplementary data used).
   - b. Oats. (The acreage of oats given in the census was treated as spring. If the 1909 acreage of winter oats per county had been available, the southern border of the summer-winter type of annual cropping could have been mapped more accurately. See page 18.)
   - c. Barley. (The acreage of barley given in the census was treated as spring.)
   - d. Emmer and speltz.
   - e. Flax.
   - f. Potatoes.
   - g. Grains cut green. (This acreage could not be used, as it contained both winter and spring grains.)
   - h. Peas. (The acreage in the Northern States was classed here. In the Middle States, where the acreage is very small, peas were omitted.)
   - i. Buckwheat.

3. Summer annuals such as are favored by warm or hot summers. (Length of season required had considerable weight in placing a few of the crops in this group.)
   a. Corn.
   b. Kafir corn and milo.
   c. Sugar cane.
   d. Sorghum cane.
   e. Broom corn.
   f. Millet and Hungarian grasses.
   g. Coarse forage. (The acreage of coarse forage according to the census schedule is made up almost wholly of summer annuals.)
   h. Cotton.
   i. Tobacco.
   j. Rice.
   k. Beans.
   l. Peas. (The acreage given in the more southern states was classed as summer.)
   m. Peanuts.
   n. Hemp.
   o. Sweet potatoes and yams.

B. Crops treated as perennials. (This division is not used in studying the effect of heat upon farming.)
   1. Cultivated crops.
      a. Clover alone.
      b. Timothy alone.
      c. Timothy and clover mixed.
      d. Alfalfa.
      e. Other tame and cultivated grasses.
      f. Hop. (This acreage was used only in cases where the cultivated area was desired.)
   2. Crops not cultivated.
      a. Wild, salt, and prairie grasses.

THE SIX PRINCIPAL TYPES OF ANNUAL CROPPING

Three things, mathematically speaking, have but six possible arrangements; so it is with the three groups of field crops

classed under the head of "cultivated crops treated as annuals." In certain regions conditions are such that winter annuals occupy the greatest part of the acreage given to annuals. In other regions the acreage of spring annuals or the acreage of summer annuals may occupy first place. Each of the regions thus determined can again be subdivided. For example, in a region where the acreage of winter annuals stands first, it may be that in some parts summer annuals stand second and in other parts spring annuals occupy that place. Thus from the six possible arrangements we derive the six types of cropping. The subdivision of these six principal types could be carried even further by determining the relative standing of particular crops within their respective groups. In this bulletin, however, very little use is made of the minute divisions that are possible.

TABLE 1.—*The six principal types of annual cropping.*

Place according to acreage	Spring-summer type	Spring-winter type	Summer-spring type	Summer-winter type	Winter-spring type	Winter-summer type
1st	Spring	Spring	Summer	Summer	Winter	Winter
2nd	Summer	Winter	Spring	Winter	Spring	Summer
3rd	Winter	Summer	Winter	Spring	Summer	Spring

Table 1 describes and names the six principal types of annual cropping. It will be observed that the name of a type is determined by the relative standing of its two most important groups of annuals. A sample problem will serve to explain the method of determining and mapping these types. According to the Thirteenth Census of the United States the 1909 acreage of various crops treated as annuals in Fillmore county, Nebraska, was as follows:

Crops	Acres
Corn	119,007
Oats	36,443
Wheat	85,893
Emmer and Speltz	344
Barley	88
Buckwheat	2
Rye	40

Kafir corn and milo maize	12
Dry edible beans	0
Flax	10
Millet and Hungarian grasses	222
Grains cut green	27
Coarse forage	309
Potatoes	957
Sugar beets	0
Cane, sorghum	7

These acreages were treated and grouped as follow:

WINTER		SPRING		SUMMER	
Winter wheat	85,739	Spring wheat	*154	Corn	119,007
Rye	40	Oats	36,443	Kafir	12
		Emmer and speltz	344	Millet	222
		Barley	88	Coarse forage	309
		Flax	10	Cane	7
		Potatoes	957		
		Buckwheat	2		
Winter acreage	85,779	Spring acreage	37,998	Summer acreage	119,557

Winter acreage	85,779 or	35.2%
Spring acreage	37,998 or	15.6%
Summer acreage	119,557 or	49.2%
	243,334 or	100.0%

Since the summer group stands first and the winter group second in order of importance, the annual cropping system of Fillmore county, Nebraska, in 1909 belonged to the summer-winter type.

CROP BOUNDARIES

The map on page 18 (Fig. 7) shows the approximate boundaries of the six types of annual cropping as they existed in the crop year 1909. The heart of the Corn Belt is made up of the summer-spring and summer-winter types. To the north of the Corn Belt and along the Pacific coast the dominant type is spring-summer. Most of the Rocky Mountain region and some of the cooler parts of the Great Lakes region belong to the spring-winter type. The two remaining types

*The acreage of spring wheat was taken from the Nebraska Agricultural year book (crop year 1909) and subtracted from the total acreage of wheat reported in the census. The remaining acreage was classed as winter wheat.

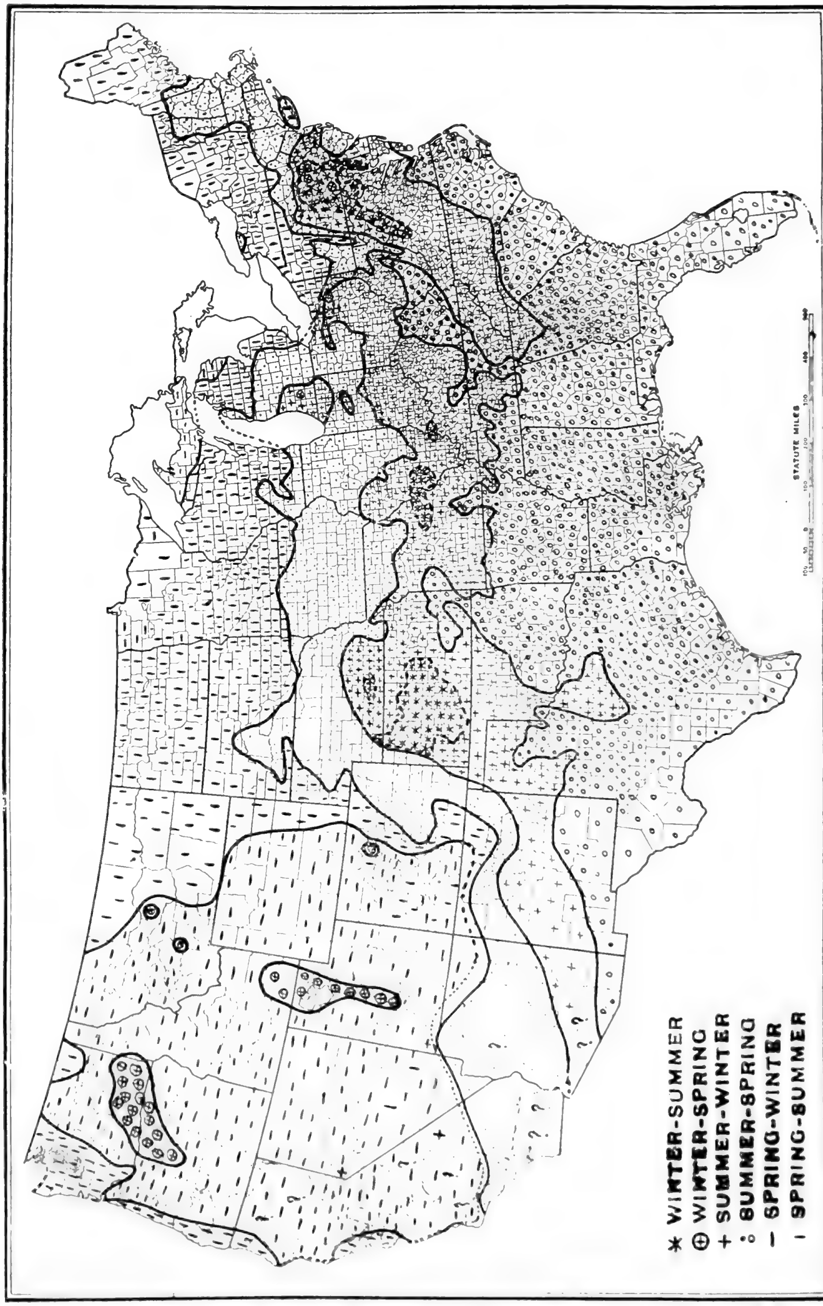

Fig. 7. The approximate boundaries of the six principal types of annual cropping in the United States. (Crop year, 1909.)

occupy relatively small areas within those already mentioned. The winter-summer type develops at certain points within the summer-winter areas. The largest developments of this type are in western Kansas and southeastern Pennsylvania. The winter-spring type may develop in either the spring-winter or the winter-summer areas. Its most accurately defined area covers a part of southeastern Washington and north-central Oregon. This type is also indicated on the map as occurring in Idaho, Utah, Montana, Colorado, Michigan, Ohio, and Pennsylvania. In as far as was possible to determine, the southern states belong largely in the summer-spring type of cropping. Tho the name of the southern type of annual cropping is the same as that applied to the cropping in the northern part of the Corn Belt, the two regions are very different when one comes to compare the per cent of annuals falling in the summer group. In the southern states the summer group commonly occupies from 85 to 90 per cent of the acreage of land given to crops treated as annuals, while in the northern part of the Corn Belt this group occupies only 50 to 60 per cent of such acreage. If the above measurements are true the cropping in the northern half of the Corn Belt and the cropping in the southern states may be looked upon as examples of two divisions of the summer-spring sype.

CROSS-SECTIONAL VIEWS OF VARIOUS TYPES OF ANNUAL CROPPING

The cross-sectional views (Figs. 8 and 9) drawn from data entering into the map on page 18 make it possible to study the relationship of one type to another. Figure 8 is a cross-sectional view along a line extending from southern Arkansas to the extreme northern part of Michigan. The per cent of the acreage of annuals given to the winter group is extremely low along the line in Arkansas; but by the time one reaches St. Louis County in Missouri, the winter group has come to occupy over 50 per cent of the land in annuals. To the north of this county, winter annuals drop out rapidly. If the acreage of spring rye does not have too great an influence, one can say that there is a tendency for winter an-

nuals to increase slightly while crossing Wisconsin and northern Michigan.

Beginning at the southern end of the line in Arkansas the summer group of annuals stands over 85 per cent as far north as Ripley County in Missouri. North of this point summer annuals drop out rapidly until they finally stand at almost zero in Kewaunee County, Michigan. It will be observed that along this line, from southern Arkansas to northern Michigan, it is the summer rather than the spring annual group that gives way to winter annuals.

The most striking thing to be observed concerning the spring annual group is that its rate of increase to the north is comparatively steady. In all cross-sectional studies thus far made, the rate of change for the spring annual group has been more uniform than that of the other groups.

The vertical crayon-like lines in the graph (Fig. 8) mark the boundaries between types. These occur wherever two heavy solid lines cross one another. Named in order from south to north the types are as follows: summer-spring, summer-winter, winter-summer, summer-winter, summer-spring, spring-summer, and spring-winter.

The cross-sectional view of types in southeastern Washington and north-central Oregon (Fig. 9) gives the relation existing between the spring-summer, spring-winter, and winter-spring types. At the southern end of the line, which is in Baker County, Oregon, winter annuals stand at about 16 per cent. In north-central Oregon, some eighty miles to the northwest along this line, winter annuals come to occupy over 80 per cent of the acreage. Continuing northwest, winter annuals drop out rapidly until they reach almost zero in Snohomish County, Washington. Spring annuals, it will be seen, vary inversely as the winter annuals, for the summer annual group thruout this cross-section stands so low that it has almost no effect. This is particularly true where winter annuals occupy first place.

The broken lines crossing the graphs (Figs. 8 and 9) serve as an index to the quantity of heat above freezing that is nor-

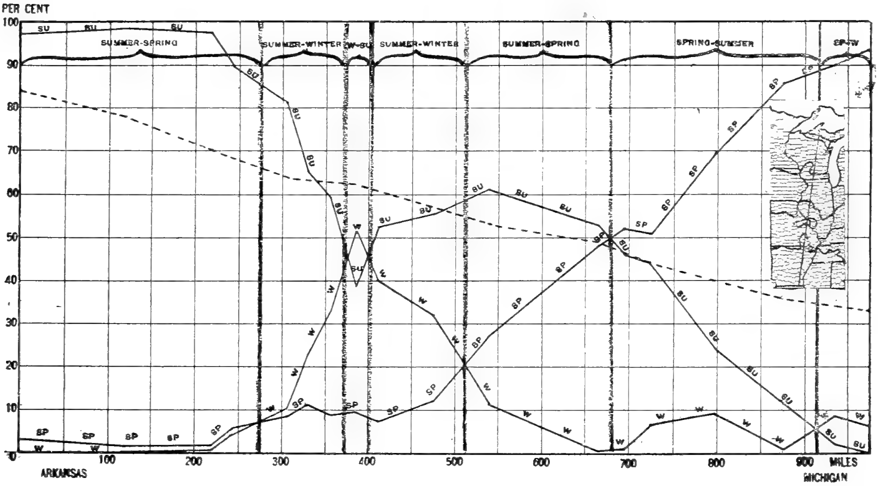

Fig. 8.—A cross-sectional view of annual cropping along a line extending from southern Arkansas to the extreme northern part of Michigan. (See key map placed on the right-hand side of the graph.)

mally received during the year. To reduce the quantity of heat from degrees to per cent, 450 month-degrees above freezing was used as a base. This quantity of heat is found in only the warmest parts of the United States.

MONTH-DEGREES ABOVE FREEZING

Figure 11 will show where this quantity of heat (450 month-degrees above freezing) is found in southern Texas. To calculate a similar figure for any given Weather Bureau station, it is only necessary to determine the total of the normal mean temperature of the months above freezing and subtract from the sum as many thirty-twos as there are months having a normal mean temperature above freezing.* This gives what is spoken of here as month-degrees above freezing or, in brief, simply month-degrees. Thirty-two degrees is used as the lower limit because it marks a point below

*Sample problem:—Calculation of the month-degrees at the University Farm, Lincoln, Nebraska.

Normal mean temperature: Jan., 24.9; Feb., 25.3; March, 41.6; April, 52.7; May, 62.3; June, 71.1; July, 76.0; August, 75.0; Sept., 67.4; Oct., 55.0; Nov. 40.6; Dec., 28.1.

(41.6+52.7+62.3+71.1 +76.0+75.0+67.4 +55.0+40.6) — (9x32) = 253.7 month-degrees above freezing.

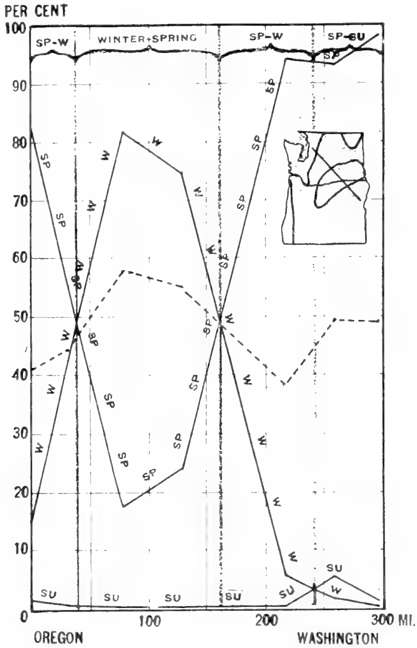

Fig. 9.—A cross-sectional view of annual cropping along a line extending from northeastern Oregon to northwestern Washington. (See key map placed in the upper right-hand corner of the graph.)

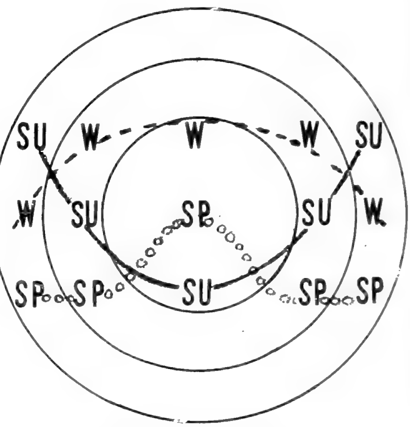

Fig. 10. A diagram of the occurrence of the winter-spring type of annual cropping within the winter-summer and summer-winter types.

which the growth of agricultural plants almost ceases. Some persons prefer 36° F. or even 40° F. as a lower limit. There can, however, be no good reason for choosing an arbitrary point so long as 32° F. is less questionable and better known.

BOUNDARY LINES DETERMINED LARGELY BY HEAT

The lines separating one type of annual cropping from another (Fig. 7) are to a large extent determined by heat. The boundary between the spring-summer and summer-spring types east of the Rockies follows in general the line of 200 month-degrees. (See Figs. 7 and 12.) West of the Rockies the boundary between these two types of cropping could not be accurately determined. The boundary line that is shown on the map (Fig. 7) appears to bear no relation to the line of

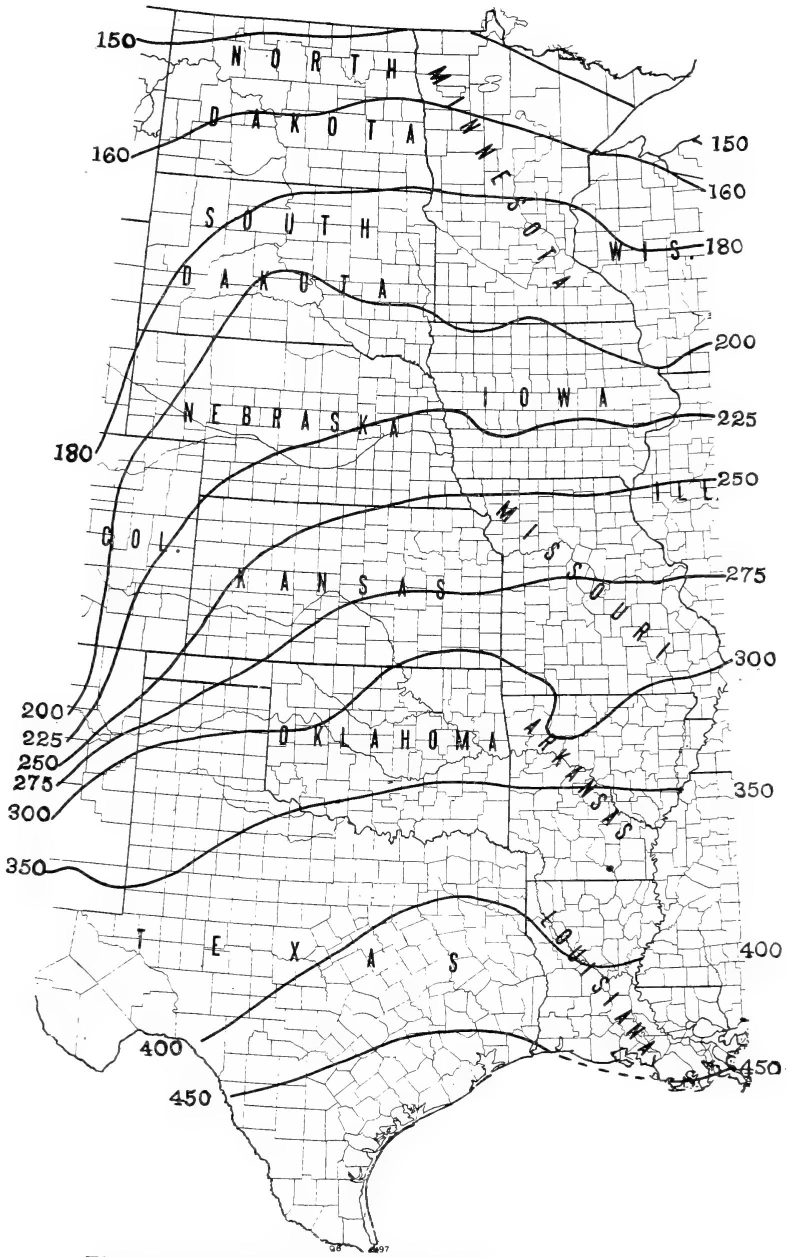

Fig. 11.—Month-degrees above freezing.

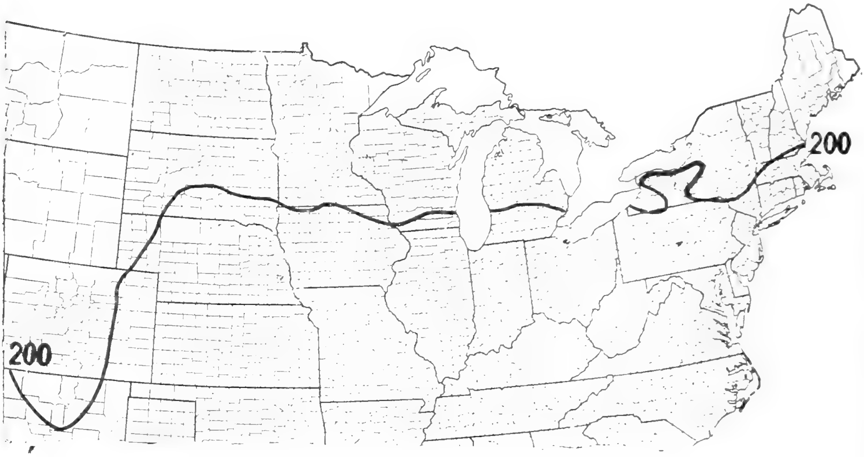

Fig. 12.—The line of 200 month-degrees above freezing marks very closely the boundary between the spring-summer and summer-spring types of annual cropping east of the Rockies.

200 month-degrees west of the Rockies. Question marks appear on the map at points where the classification was most difficult and inaccurate. To classify this part of the United States one would need in some cases to use township or precinct data in the place of county data. Furthermore the acreage of winter annuals would need to be more carefully separated from the acreage of spring annuals.

The boundaries of the summer-winter and winter-spring types are in close harmony with certain quantities of winter wheat. The center of the summer-winter and winter-spring types are usually found close to the line where winter heat measures zero month-degrees. (See Fig. 13.) Each of the winter-annual areas in 1909 occupied areas where the winter heat measured not less than —25 month-degrees. While the northern limit was closely marked by —25, the southern limit was almost as closely marked by +25 month-degrees of winter heat. (It will be observed that crop boundaries and heat lines are again found to be most at variance with one another in the southwestern part of the United States.)

Since in the summer-winter and winter-spring regions winter annuals are more or less active from September 1st to

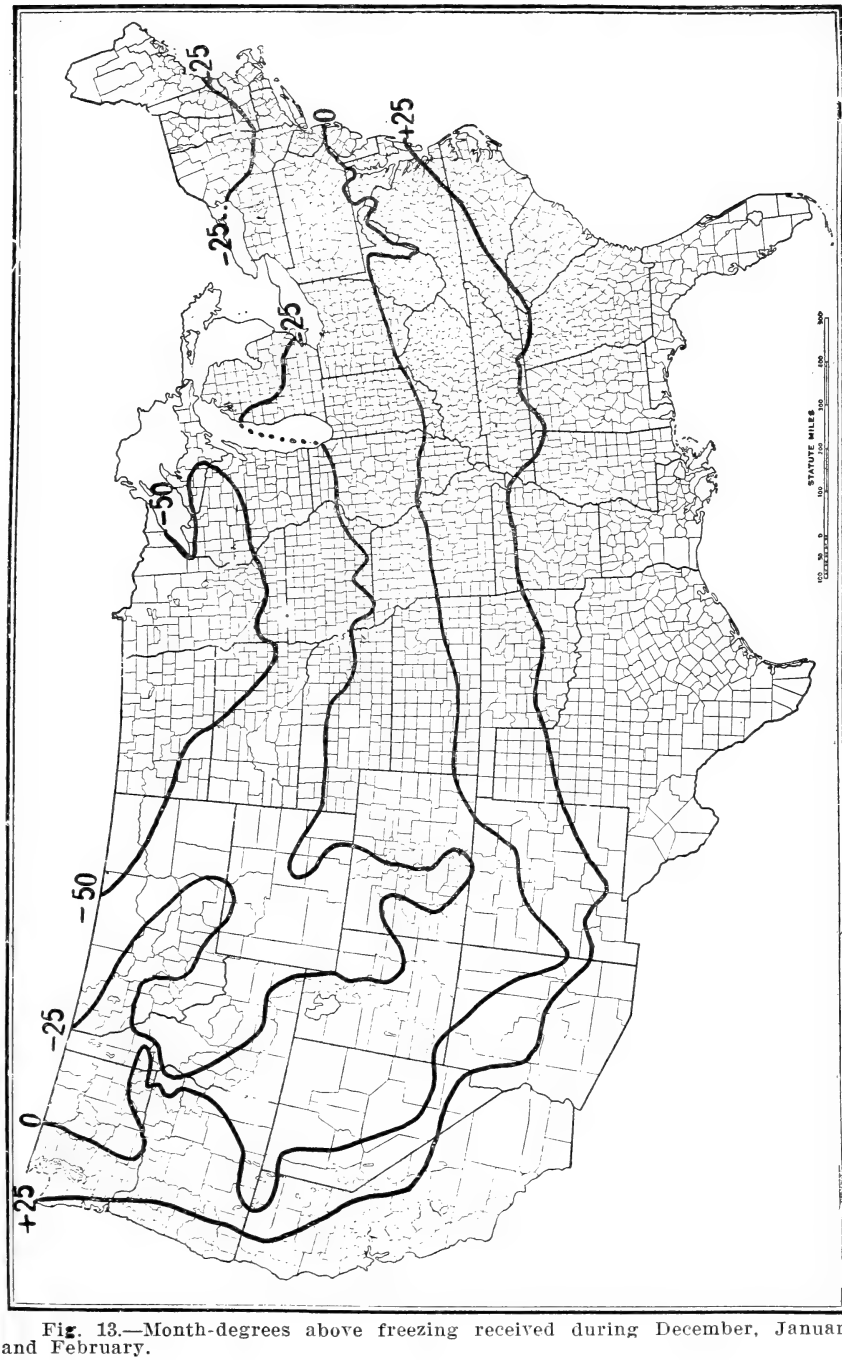

Fig. 13.—Month-degrees above freezing received during December, January, and February.

July 1st the quantity of heat above freezing has also been determined for this period. Figure 14 defines the boundaries of a belt of country in the United States which receives from 150 to 230 month-degrees above freezing between September 1st and July 1st. The small circles placed to the north of this belt mark certain points that receive during the winter annual season not less than 138 month-degrees. Only a few winter annual areas will be found to the north of these points.

THE EFFECT OF FACTORS OTHER THAN HEAT

Tho heat has the greatest effect upon the boundaries of crop types, rainfall, soil, and economic conditions can have a marked influence. A few examples will suffice to illustrate how heat alone will not fully account for the position of certain crop boundaries. Thus the area of winter-summer cropping in western Kansas is determined to a large extent by July and August droughts that are accompanied by extreme heat. Winter wheat in this area escapes the hot droughty period more often than corn and other summer annuals. If it were not for this fact this area would without much doubt drop back to the summer-winter type. The factors just mentioned also influenced the development of the small island of winter-summer cropping in south-central Nebraska, but here extremely level land was also a factor. This type would, in all probability, not have appeared at this point in 1909 had the land been hilly.

The position of boundary lines in a given year throws some light on the economic question of profits derived from certain crops. As an illustration, the boundary line drawn around the winter-summer type in western Kansas must define an area within which, according to the experience of farmers, an acre of winter annuals had been paying better than an acre of summer annuals. When one stops to consider that in this area winter wheat is about the only winter annual and corn is the leading summer annual, it is not far wrong to assume that here an acre of winter wheat previous to 1909 had been paying

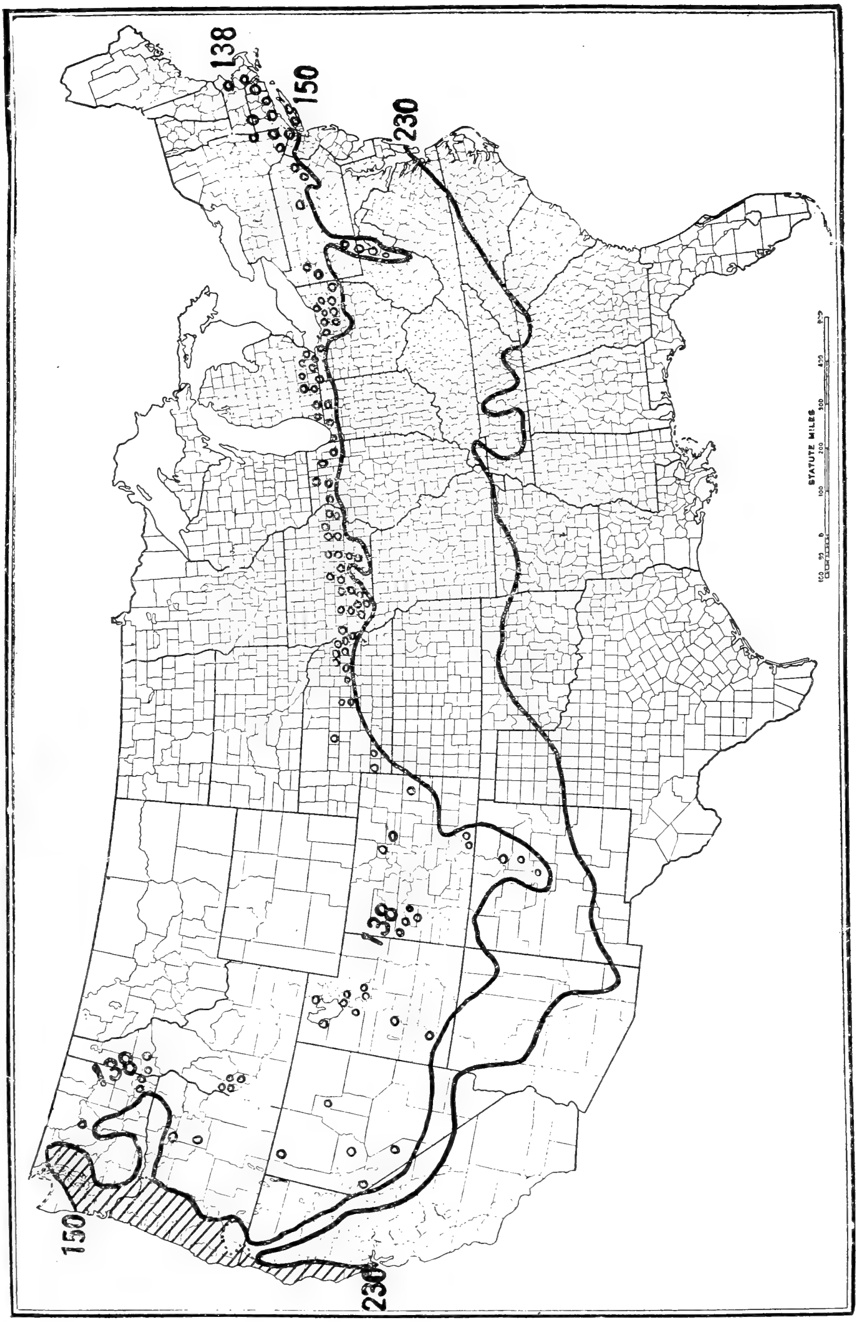

Fig. 14.—Month-degrees above freezing received between September 1st and July 1st. The small circles mark points that receive during this period not less than 138 month-degrees above freezing. The barred part of the belt on the Pacific coast indicates very cool summers, i.e., summers measuring less than 100 month-degrees above freezing.

better than an acre of corn. If it were not for the fact that an acreage of one group of annuals sometimes of necessity carries with it a certain acreage of another group, this line of reasoning could, without much modification, be applied to all type boundary lines. For example, it would be only approximately correct to state that in changing from a corn and oat region to a corn and wheat region the boundary line between the two marked the point at which the profits from an acre of winter wheat began to exceed those from an acre of oats. It would be more nearly correct to say that the boundary line marked the point at which the profits from a given acreage of corn and wheat began to exceed the profits from a given acreage of corn and oats.

SIZE OF FARM IN RELATION TO RAINFALL AND OTHER FACTORS IN THE GREAT PLAINS

DEFINITION OF THE TERM FARM

A farm, generally speaking, is the area of land from which a family derives a living thru such operations as cultivating crops, cutting wild hay, pasturing native grasses, and feeding live stock. Broadly construed, this definition makes it possible for a single farm to include owned land, leased land, and "free range." If the area of free range were to be excluded, the use of the term farm in this bulletin would be similar to its use in the Thirteenth Census.

Two extracts from the instructions for the general agricultural schedule (1910) will serve to illustrate the census use of the word farm.

> *Farm.* A "farm," for census purposes—that is, for which a general farm schedule should be obtained—is all the land which is directly farmed by a single person, managing and conducting agricultural operations, either by his own labor alone or with the assistance of members of his household or of hired employees. The term "agricultural operations" is here used as a general term referring to the work of growing crops, producing other agricultural products, and raising animals, fowls, and bees. A farm as thus defined may consist of a single tract of land or a number of separate and distinct tracts

situated in the same or in different enumeration districts, and may be held under different tenures, as where one tract is owned by the farmer and another tract leased by him.

For example, if A B operates or cultivates under his personal management one tract of 60 acres in one place and another tract of 30 acres in another place, these two separate tracts constitute one farm of 90 acres. But if A B owns 90 acres of land in one tract but cultivates under his personal management only 60 acres of such tract and leases the other 30 acres to another person, C D, the farm of A B consists of but 60 acres—that is, the number of acres actually farmed or operated by him, the remaining 30 acres constituting the farm, or part of the farm, of C D. Or, again, if A B owns 90 acres of land which he ordinarily considers as "his farm," but leases 30 acres from C D, then the farm of A B consists of 120 acres—that is, the total number of acres actually farmed by him.

Ranches using public lands. The farm of ranchmen using the public domain includes only the land which he owns or leases. If he leases public land or any other land, such land is a part of his farm. But his farm does not include any public land for which he pays no rental or upon which live stock are grazed at a fixed charge per head. Across the head of schedules for farms and ranches using public lands for grazing live stock write RANGE in large letters. In cases where cattle are grazed wholly upon the public domain and the owner of the animals does not own or lease any land, fill out a schedule for the owner the same as for any ordinary farm operator, omitting answers, however, to Inquiries 10 to 15 and writing in answer to Inquiry 6 the words "No land owned or leased."

When we include from a farm public land for which a farmer "pays no rental or upon which live stock are grazed at a fixed charge per head" we decrease, to that extent, the area of land from which he derives a living and his farm cannot be directly compared with one having no free range.

METHOD OF CALCULATING THE SIZE OF FARM IN THE GREAT PLAINS REGION

For western Nebraska the Thirteenth Census reports that less than two-thirds of the total area of land was oc-

cupied by farms. Field studies at many points in that part of the State lead one to believe that the people living there in 1909 would have been seriously handicapped in making a living had even the poorest one-third of the total land area been wholly excluded from agricultural use. A farm management survey made in Kimball County in 1915 indicated that the size of farm in the county was nearer two sections of land than one section as reported in the census. In all probability the number of farms in Kimball County had increased since 1909, and so it can hardly be true that a farm at that time consisted of only one section of land. It was also observed during this survey that the area of pasture land not grazed over at some time during the year was almost negligible.

Table 2 compares the average size of farms taken at random in Farm Management surveys with census figures. In most cases the average size of farm secured thru surveys (1914-1916) is more in harmony with the result obtained by dividing the total land area of the county by the number of farms it contained in 1909, than with the size of farm given in the census. If the survey figures can be relied upon, it is safe to state that practically the entire area of land is made to contribute in one way or another to the living of farmers located upon it. It is a commonly known fact that nearly every western area had, at some time previous to the last census,

TABLE 2.—*The size of farm calculated from Nebraska Farm Management surveys compared with census figures.*

County in which records were taken	Farm Management surveys			Census figures	
	Number of records	Crop year	Average size of farms taken at random in field surveys	Total area of the county divided by the number (1909)	Size of farm as given in the census (1909)
Western counties					
Kimball	36	1916	1068 A	1491 A	644 A
Box Butte	55	1914	967	1171	931
Dawes	45	1915	1143	1148	698
Thomas	67	1915	1369	1723	778
Eastern counties					
Phelps	66	1915	241	233	225
Seward	63	1915	216	160	163
Thurston	50	1915	220	227	169
Madison	62	1915	228	207	197

seen ranchers strongly opposed to increasing the number of farms. Even in those times they must have felt that, to make a living under such economic conditions as they were experiencing, it was necessary to use practically all of the land.

The first calculations of the size of farm per county in this State were based upon the assumption that only a very small part of a county was not being used by the people farming there. An attempt was made to eliminate from the total acreage of each county (1) the area occupied by the very small farms reported in the census and (2) the area occupied by town lots and railroads. It was soon found (1) that the very small farms could not consistently be separated from the largest farms and (2) that the area of land occupied by towns and railroads combined did not as a rule amount to one per cent of the area of the county. Further studies brought out the fact that the relation between the number of very small farms and the area of land occupied by towns and railroads was such that one always tended to offset the effect of the other when the total area of the county was divided by the total number of farms. Figures bearing upon the size of farm in the vicinity of Omaha will illustrate this tendency of very small farms to offset even a large area of land in town lots and railroads. According to the order followed in the first method of study, it was estimated that Douglas county, in which Omaha is located, had 29,560 acres of land occupied by towns, railroads, and very small farms. The remaining area of Douglas county was then divided by the number of larger farms. This gave 168 acres per farm. Following the order of the second method the total area of the county was simply divided by the total number of farms. This gave 123 acres per farm. As a check on these figures a field study (1917) was made in Papillion precinct in Sarpy county some seven miles southwest of the South Omaha market. The area covered was 18,880 acres. The average size of farm here proved to be 126 acres. Judging from this study and also from field observations in practically all precincts in Douglas county, the second method of calculating the size of farm gives

a more accurate idea of open farming country than the first. Another very important point in favor of the second method is its freedom from any arbitrary rulings concerning very small farms.

When the total area of the county is used, it gives a stable basis from which to measure any change in the average size of farm brought about thru either an increase or a decrease in the number of farms. Table 3 illustrates the importance of this fact. In the first column of the table are found the names of the type areas in Nebraska and also the

TABLE 3.—*The size of farm as affected by the number of farms within a given area.*

Nebraska type areas. The figures indicate the total acreage of counties chosen to represent a type area.	Number of all farms in 1900	Number of all farms in 1910	Total area divided by total number of farms		Size of farm given in census	
			1900	1910	1900	1910
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2,314,240 acres used	14,520	13,521	159	171	155	164
Cass type area		—		+		
Thayer		—		—		+
5.959,680	34,657	32.323	172	184	169	178
Wayne		—		—		—
4,747,987	20,254	20,743	234	229	232	213
Buffalo		+		—		—
2,542,720	9,083	9,777	280	260	263	240
Harlan		—		+		+
5,521,280	20,361	19,839	271	278	250	264
Custer		+		—		—
2,829,440	6,939	8,194	408	345	321	316
Boyd		+		—		+
2,369,920	3,764	4,007	629	591	320	549
Hitchcock		+		—		+
3,091,840	3,619	4.588	855	674	514	531
Chase		+		—		+
4.231,040	2,545	5,093	1,662	831	473	502
E. Sand Hills		+		—		+
2.994,560	2,016	3,486	1,486	859	439	629
High Plains		+		—		+
4.753,280	2,654	4.203	1,789	1,129	709	746
W. Sand Hills		+		—		+
5,818,240	1,334	3,266	4,359	1,781	661	859

total area of the counties used in determining the average size of farm. The second column contains the number of all farms in 1900 that were located within the area of land indicated

in the first column of the table. The third shows the number of all farms within this same area of land in 1910. Columns 4 and 5 of the table give the calculated average size of farm for 1900 and 1910 respectively, while columns 6 and 7 give the average size of farm as recorded in the census. It will be observed that where the number of farms in 1910 shows an increase over 1900, the average size of farm recorded in the census decreases in eastern areas and increases in western areas. For example, in 1900 some five million acres of land in the western Sand Hills held 1,334 farms. Ten years later the number of farms on this area of land had increased to 3,266. The total area of land divided by the number of farms gives 4,359 acres per farm in 1900 and 1,781 acres in 1910. From the standpoint of the average area of land required to make a family living in those years, the figures are not far out of line with the experience of thrifty ranchers and farmers living there. Regardless of the fact that the number of farms in the western Sand Hills more than doubled between 1900 and 1910, the census records a 30 per cent increase in the size of farm. This increase in size would not appear if all land grazed had been included in farm.

It is seldom that large areas of grass land in the Great Plains are so completely withheld from farm use as to reduce agricultural practices to zero. Where land is partly withheld farmers and ranchers simply practice more extensive methods of farming than the other factors in the region would actually require. What is here said of grass lands will not apply to the timber lands found in northern Minnesota and Wisconsin. In this area, part of the land is used by lumber companies and cannot be classed as land in farms. The fact that much of this heavy timber must be cleared before the land can have any farm use makes it relatively easy to hold large tracts of timber from agricultural use. From these facts it can readily be inferred that in a timber region the area of a county divided by the number of farms contained cannot give a true index to the average size of farm. Tho size-of-farm lines, so determined, have been drawn across northern Minnesota and Wisconsin, they are of value only when compared with the

acres per person. A study of figures 24, 25, 26, and 27 in comparison with figures 28, 29, 30, and 31 will bring out the fact that the land in northern Minnesota and Wisconsin furnishesa living for more than is indicated by the size-of-farm lines. It will be observed that ordinarily in a grass-covered region the 1280-acre lines are found very close to the lines indicating 200 acres per person (total population). The 1280-acre lines drawn across the timber region would probably cross about as far north as the lines indicating 200 acres per person if it were possible to reduce lumbering to a farm basis.

A summary of the above discussion will bring out more clearly the chief considerations that led to basing size-of-farm studies in the Great Plains on simply the area of a county divided by the number of farms contained. (1) When a farm is defined as the area of land from which a family derives a living thru such operations as cultivating crops, cutting wild hay, pasturing native grasses, and feeding live stock, nearly all of the land in the Great Plains can be looked upon as farm land. (2) The area occupied by town lots and railroads tends to be offset by the number of very small farms. (3) The total area of the county gives a stable basis from which to measure any changes in the average size of farm due to a change in the number of farms.

METHOD OF MAPPING THE DATA

From county data contained in the census the size of farm has been determined for each county (counties in Oklahoma excepted*) in the Great Plains region and certain bordering areas to the east. The study includes census reports as far back as 1880. Maps drawn after the plan of those commonly used by the Weather Bureau are here used to summarize the size-of-farm data. This method of mapping makes it a simple matter to compare the trend of any given size-of-farm line with the trend of precipitation lines.

*Since Oklahoma did not develop in harmony with the other states in this region, it is here omitted.

THE WESTERN EDGE OF 160-ACRE FARMING

In 1880 the 160-acre farm was common as far west as northwestern Missouri, central Iowa, and southwestern Wisconsin. A study of figure 19 will show that the 160-acre lines remained almost stationary in Kansas, Nebraska, and Iowa for a period of thirty years. The great expansion during the period between 1880 and 1910 took place to the west, north, and south of this strip of country. Barring soil effects, the western edge of quarter-section farming follows very closely a normal annual precipitation of from 31 to 32 inches. (See Fig. 18.) In eastern Kansas the 160-acre lines are usually found in counties having from 35 to 40 inches of rainfall. It is here that the "flint hill section" holds the 160-acre lines to the east. In Texas the 160-acre farm advanced much farther south than west. The westward advance against a decreasing rainfall was scarcely greater than that taking place in the states to the north.

TWO-SECTION FARMING

The principal factors affecting the size of farm in the drier parts of the Great Plains can best be introduced thru a study of the 1,280-acre lines. (See Fig. 23 and also Figs. 24, 25, 26, and 27.) Between 1880 and 1910, two-section farming in South Dakota moved from a country having 24 inches of rainfall to one having but 16 inches. In central Texas during the same period this size of farm occupied the strip of country lying between the 21 and the 26 inch rainfall lines. While 1,280-acre farming in South Dakota advanced thru approximately an 8-inch decrease in rainfall, it advanced thru only about 5 inches in central Texas. The slower advance against rainfall in the south can be attributed largely to two factors, namely, greater evaporation and somewhat slower development of country. Of the factors mentioned, evaporation appears to have the greater influence.

In North Dakota and Texas the 1,280-acre lines make a fairly regular advance during each ten-year interval following 1880. In contrast with these regular movements,

the lines at many points in South Dakota, Nebraska, and Kansas show a number of reactions. This is particularly true of the lines marking the western edge of two-section farming in 1890 and 1900. One of the outstanding features of the 1,280-acre line in 1890 is its marked westward bend into northeastern Colorado. Within this bend homesteading reached one of its highest points. In the late eighties and early nineties, people here occupied a country developed more out of harmony with rainfall and heat than could be found at any point either to the north or to the south. The line drawn for the year 1900 gives at least a partial view of the reaction that followed.* It was most severe in southwestern Nebraska and northwestern Kansas. To the north and south of these areas the reactionary movement gradually disappears.

SIZE OF FARM IN RELATION TO RAINFALL AND HEAT

The size of farm in 1880 and 1910 was probably more uniformly adjusted to rainfall and heat than it was in either 1890 or 1900. (See Figs. 24, 25, 26, and 27.) Nevertheless, each map in the series just referred to shows a tendency for its lines to converge to the south more rapidly than rainfall. (See Fig. 18.) This convergence is more readily seen when the lines in the eastern quarter of Texas are covered. Figure 15 is a diagram on which the 1910 size-of-farm lines are plotted according to inches of rainfall used as degrees of longitude and month-degrees used as degrees of latitude. The 320-acre line and the lines to the east of it follow approximately the same quantity of rainfall regardless of an increase or decrease in the quantity of heat. To the west of the 320-acre line the section and two-section size of farm veer rapidly into higher rainfall to the east as the quantity of heat increases to the south. As was mentioned in the introductory discussion of the 1,280-acre lines, a small part of this variation may be due to a slower development of western farming in the south.

*It must be borne in mind that some actions and reactions were so sharp that measurements made at ten-year intervals could not fully record them.

SIZE OF FARM IN RELATION TO SOIL

From the preceding discussion one might be led to infer that the position of size-of-farm lines in the Great Plains is seldom affected by soil. The series of maps last referred to (Figs. 24, 25, 26, and 27) can also be used to illustrate certain soil effects. The "Flint Hill" section in Kansas was mentioned during a discussion of 160-acre lines. In 1880 this section stood out as an island of half-section farming in eastern Kansas. In 1890, 1900, and 1910 the size of farm is seen to be somewhat reduced but it still stands out as an area occupied by relatively large farms. The Sand Hill region in north-central Nebraska has even a more marked effect upon the size of farm. On the map of 1880 (Fig. 24) the two-section and one-section lines in northeastern Nebraska bend sharply to the east in order to avoid the Sand Hills and bordering areas of more or less sandy land. In 1890 these lines enter the eastern Sand Hills. In 1900 they recede to the eastern edge, where they almost meet the half-section line which has moved a little to the west and is just beginning to bend eastward in order to avoid sandy land. By 1910 the two-section line has passed beyond the Sand Hills, leaving behind it an island of very large farms to occupy the western part. While section farming has again entered the eastern Sand Hills, half-section farming in 1910 still skirts the edge.

SIZE OF FARM IN RELATION TO RAINFALL AND ECONOMIC CONDITIONS

A cross-sectional measurement of size of farm in the Great Plains region will bring out certain facts concerning rainfall and economic conditions more clearly than can be pointed out from maps. Figure 16 is a cross-sectional measurement following approximately the line of 240 month-degrees from Iowa across southeastern Nebraska and northwestern Kansas into Colorado. The purpose of following a given quantity of heat is to eliminate in as far as possible the effect of heat upon the size of farm. The choice of this particular quantity of heat was influenced by the fact that it crosses the Great Plains at a point where soil variations are

slight. It is even possible that the western soils, being a little more open and more level than the eastern soils, give a slight advantage to the western farms. With effective variation in both heat and soil largely eliminated, the study along this line can be more positively centered upon the size of farm in relation to rainfall and economic conditions. In the graph (Fig. 16), rainfall tends to give similarity to the shape of the curves while economic conditions are largely responsible for their position relative to one another. Each of these curves shows that as soon as rainfall is decreased below a certain point the size of farm increases rapidly. This point in rainfall is sometimes designated as critical rainfall. Along the line of the graph, critical rainfall varies with economic conditions. Thus in 1880, 1890, 1900, and 1910, critical rainfall stood at approximately 25.0, 19.5, 22, and 21 inches respectively. It is a rather striking fact that between 1880 and 1910 the critical point in rainfall along this line had been lowered only about 4 inches. When cross-sectional studies of this kind are made across the northern part of the Great Plains, the curves reach into lower rainfall and are less sharp. On the other hand, cross-sectional studies to the south of the 240-month-degrees line give very sharp curves that do not reach into extremely low rainfall.

SIZE OF FARM IN RELATION TO PLANT GROWTH

The connecting link between size of farm and moisture conditions in the Great Plains is plant growth. It stands to reason that where rainfall is normally low and as a result crop yields are low and pasture growth is short, a farm must of necessity occupy enough land to bring the total annual growth of usable plants to a level that will insure the average farm family a living. Figure 17 gives a view of the size of farm in relation to the total annual growth of crops and pasture. As shown by the key map accompanying the figure, the heat and soil conditions in the areas chosen are much the same as those described in the preceding cross-sectional study. In the accompanying diagram the blocks placed adjoining one

another illustrate how a farm in the Great Plains adjusts its area to overcome the effects of low crop yields and short pasture growth. The base-length of a block represents the total farm area. (Note here Table 3, columns 1 and 5.) The division of the farm area between crop and pasture land is brought out by shading. The height of one block relative to another (the height above the shading) is in harmony with the crop index of one farm type relative to another. The crop index of each of these farm types was calculated from the census and applies only to the crop year 1909. When the crop and pasture growth in the Thayer area was assumed to be 100 per cent, the Harlan and Hitchcock types measured 60.2 and 32.0 per cent respectively. Tho these measurements are based on only the crop year 1909, they serve very well as an index to normal conditions. According to the results obtained, 100 acres of the Harlan type of farm were equivalent, in 1909, to 60.2 acres of the Thayer type of farm. Comparing the Hitchcock type of farm with the Thayer type in this year, 100 acres of the former were about equivalent to 32 acres of the latter.

This principle of adjusting the size of farm to the quantity and value of plant growth is as old as dry land farming. It is practiced in all of the dry border regions of the world. Field studies in Nebraska lead one to conclude that until this principle is complied with the would-be dry farmer is barred from success.

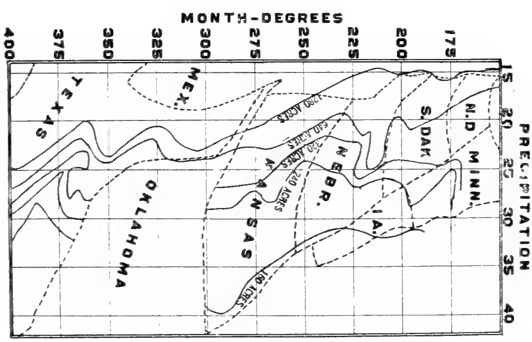

Fig. 15.—The size-of-farm lines for 1910 plotted on a diagram which uses rainfall as degrees of longitude and month-degrees as degrees of latitude.

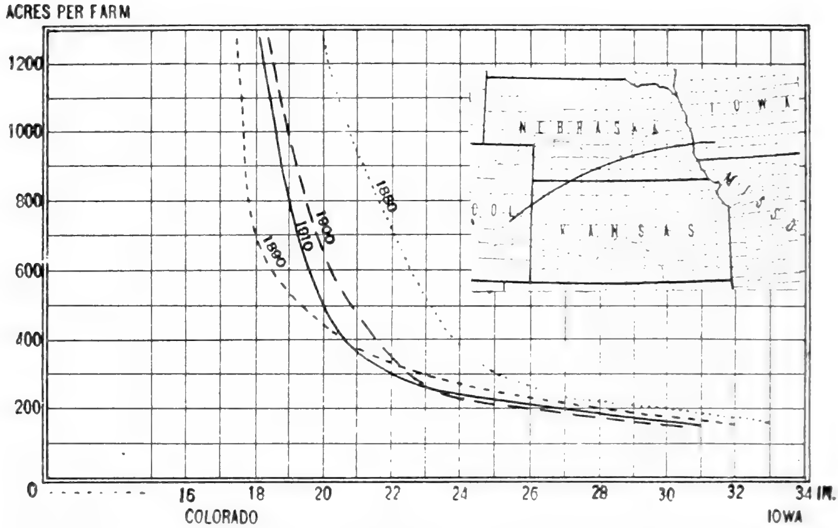

Fig. 16.—A cross-section measurement of size-of-farm following approximately the line of 240 month-degrees from Iowa into Colorado.

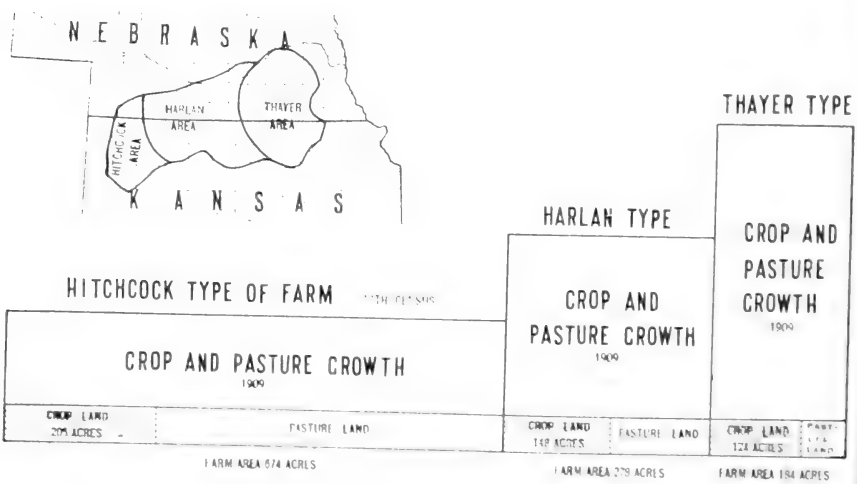

Fig. 17.—The relation of the size of farm to the total annual growth of crops and pasture.

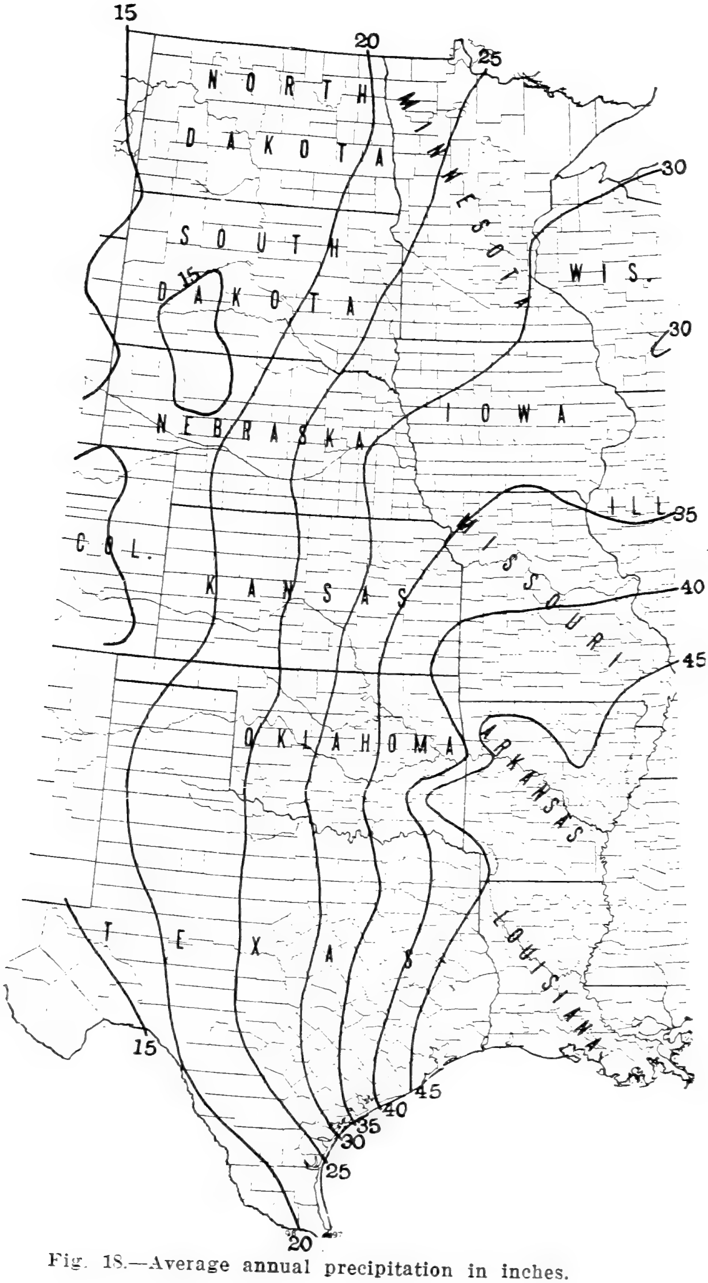

Fig. 18.—Average annual precipitation in inches.

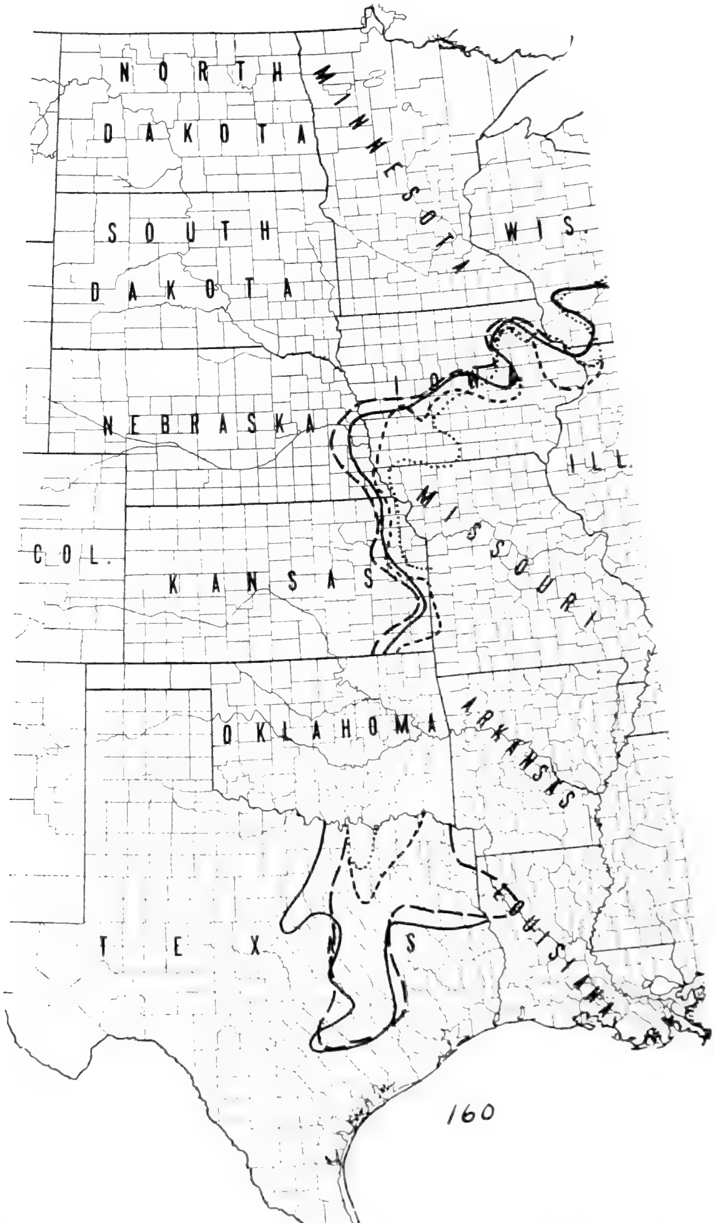

Fig. 19.- The movement of the 160-acre lines. The dotted line indicates the western margin of 160-acre farming in 1880, and the solid line the western margin in 1910

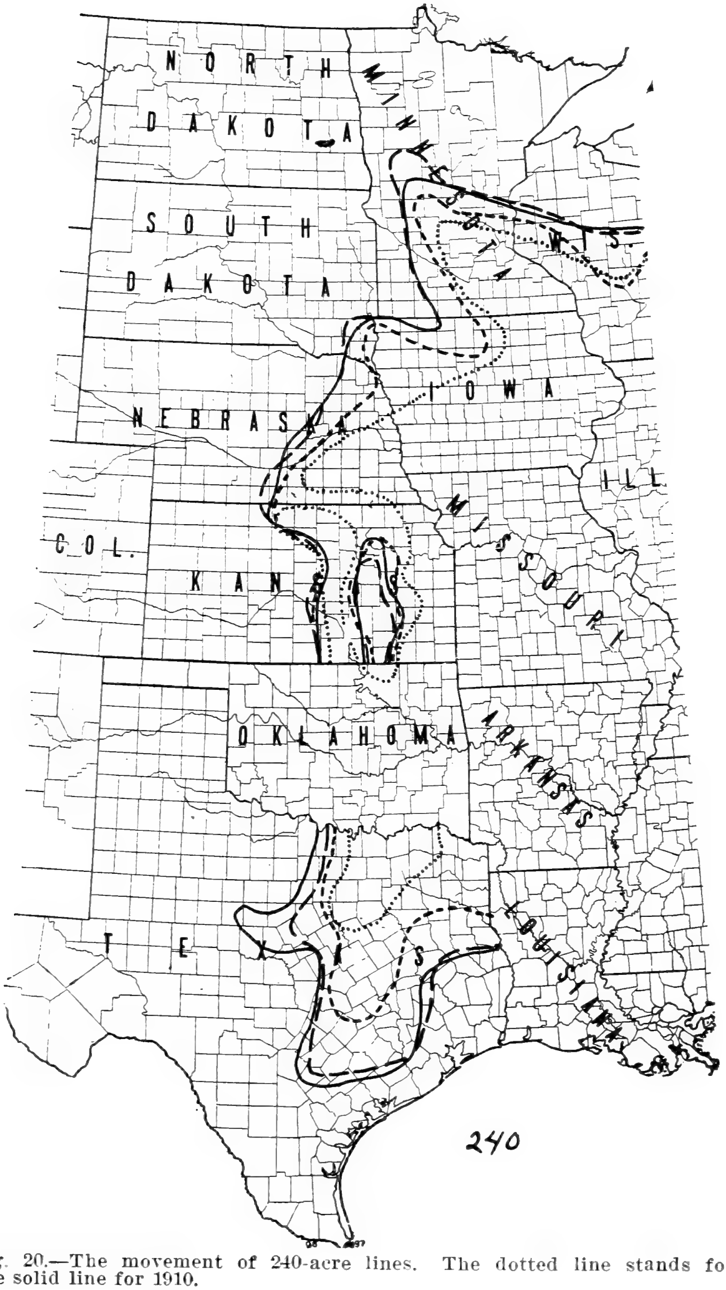

Fig. 20.—The movement of 240-acre lines. The dotted line stands for 1880 and the solid line for 1910.

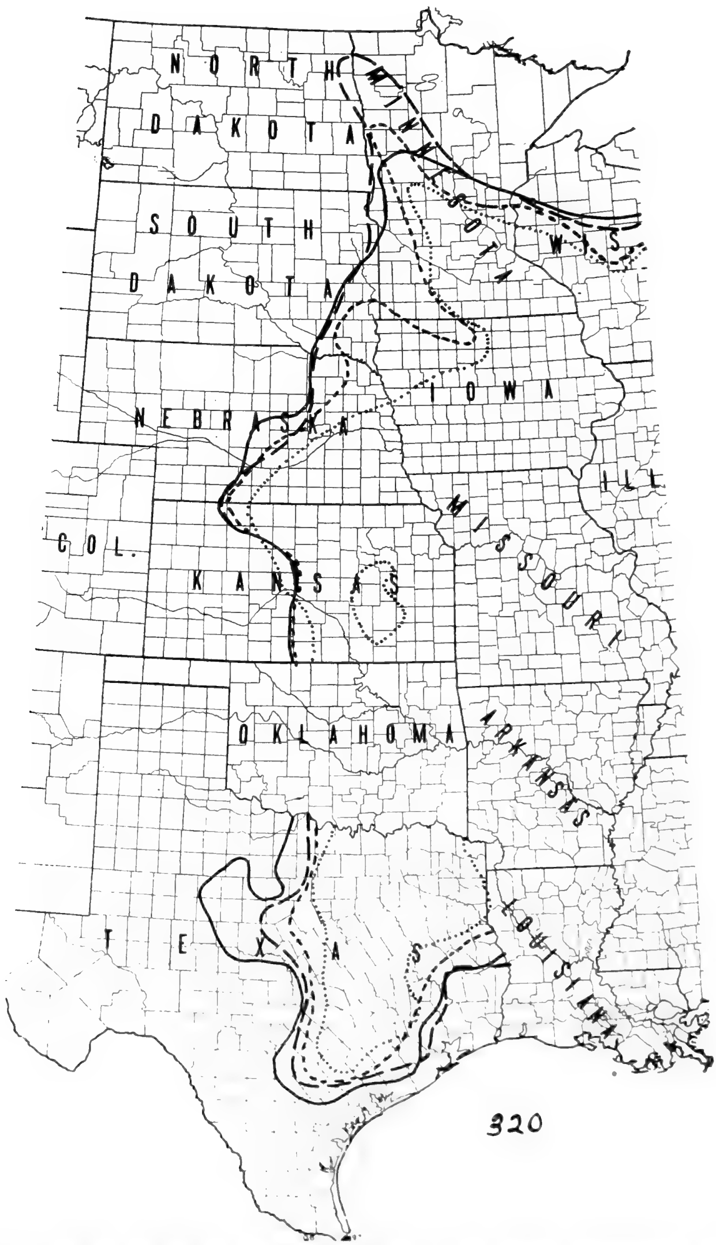

Fig. 21.—The movement of 320 acre lines. The dotted line stands for 1880 and the solid line for 1910.

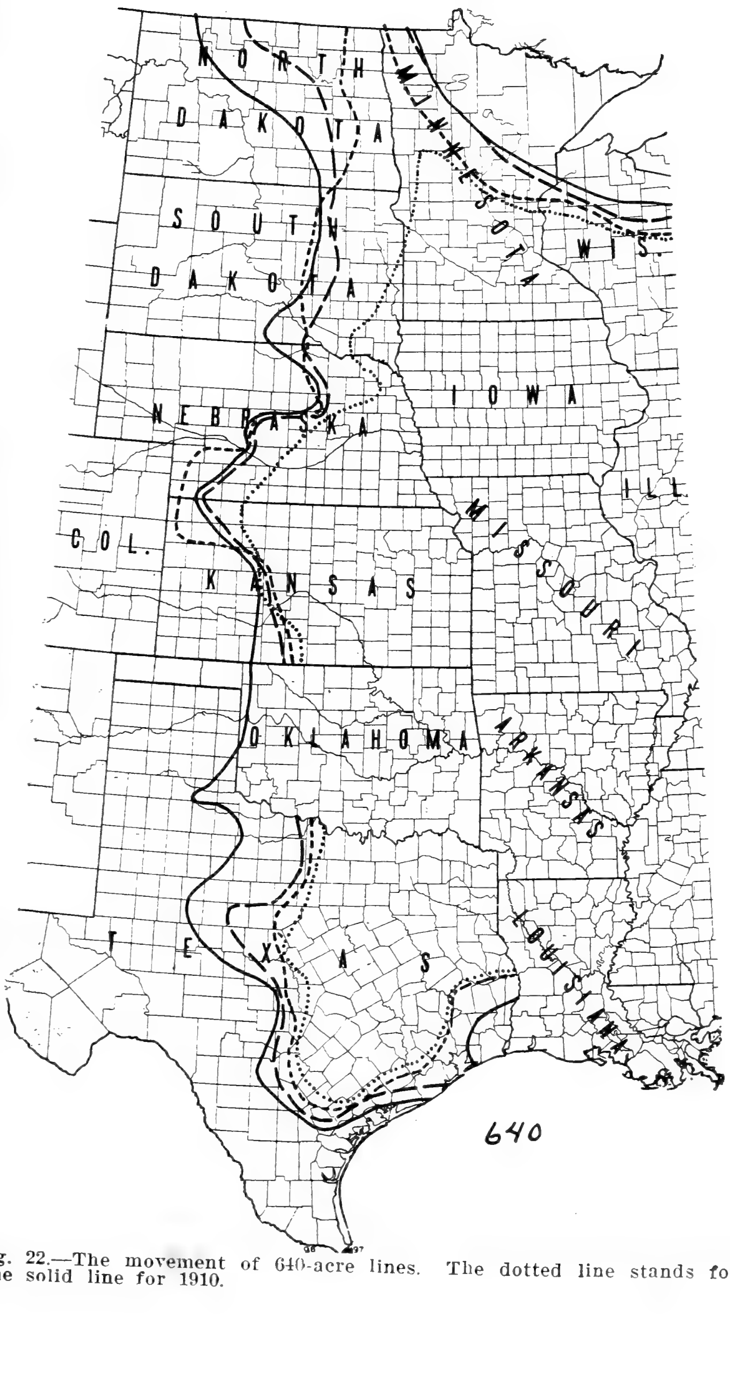

Fig. 22.—The movement of 640-acre lines. The dotted line stands for 1880 and the solid line for 1910.

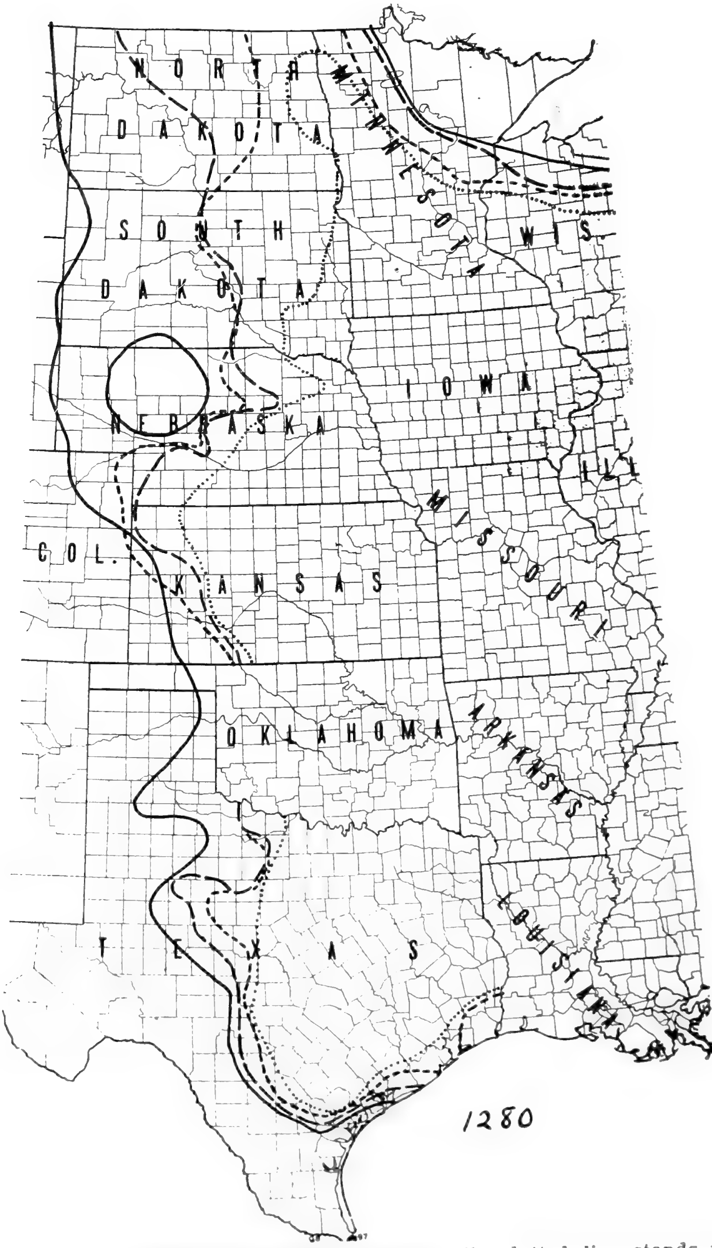

Fig. 23.—The movement of 1280 acre lines. The dotted line stands for 1880 and the solid line for 1910.

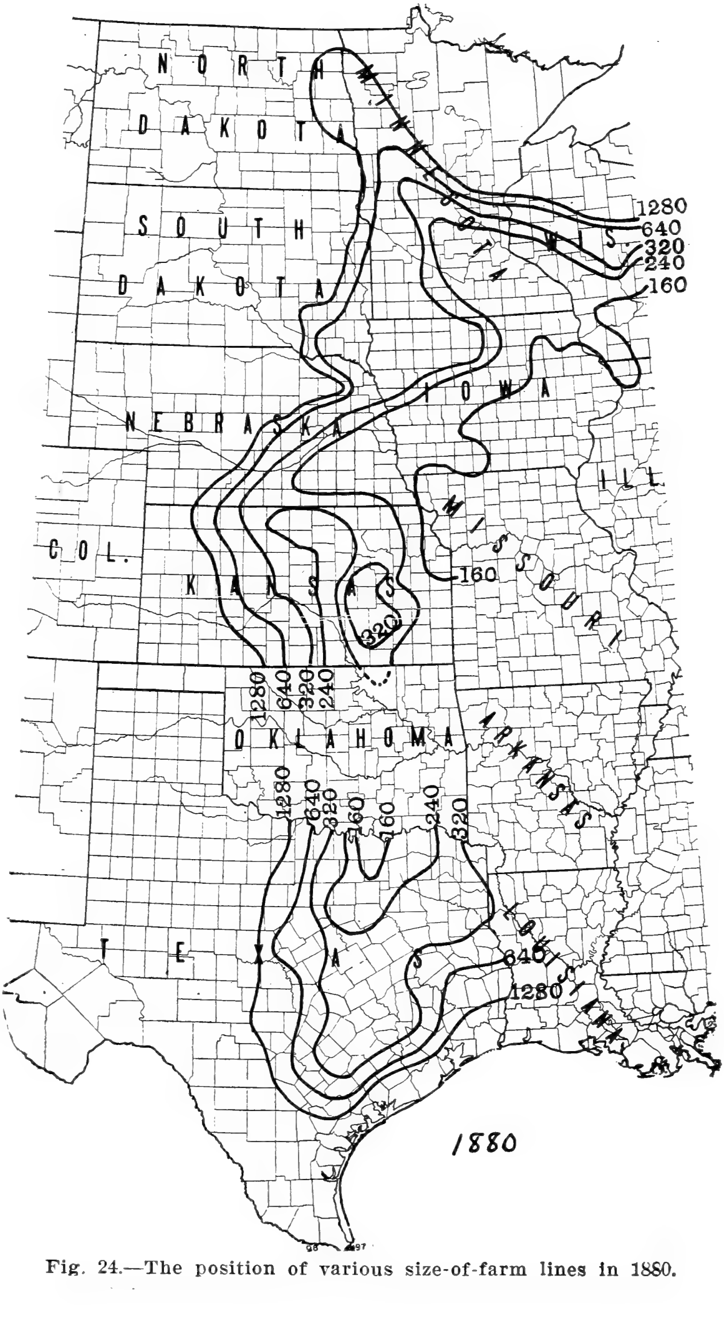

Fig. 24.—The position of various size-of-farm lines in 1880.

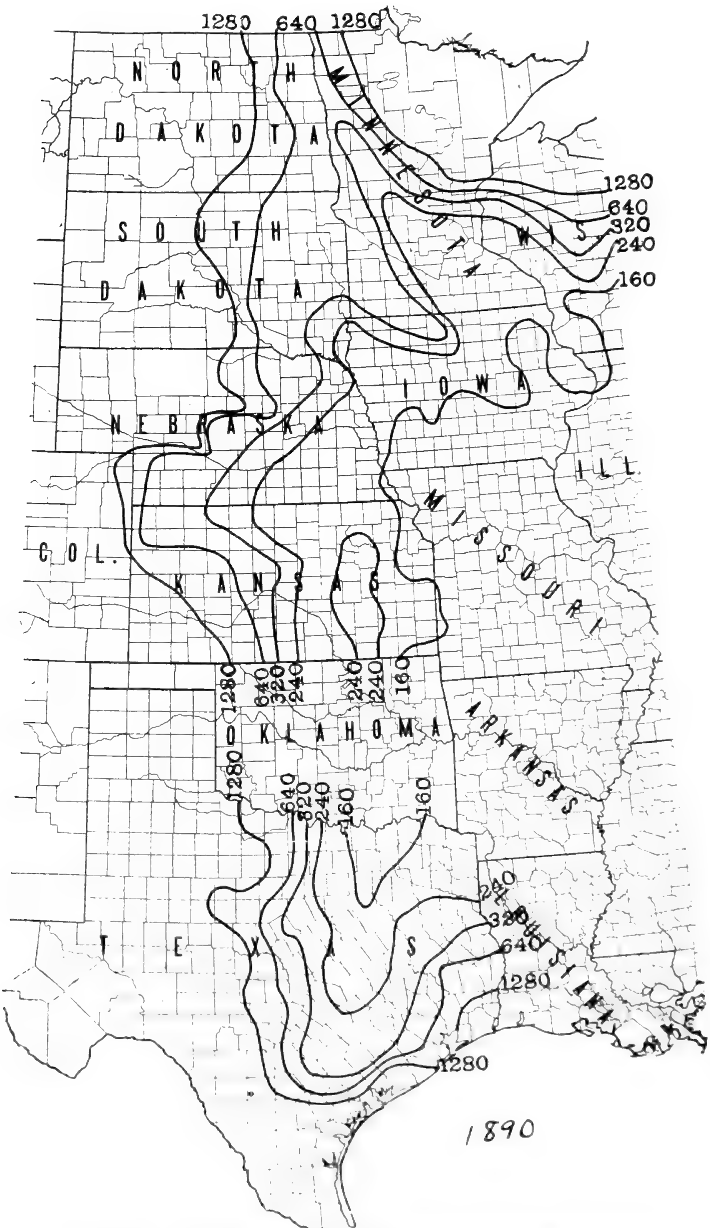

Fig. 25. The position of various size-of-farm lines in 1890.

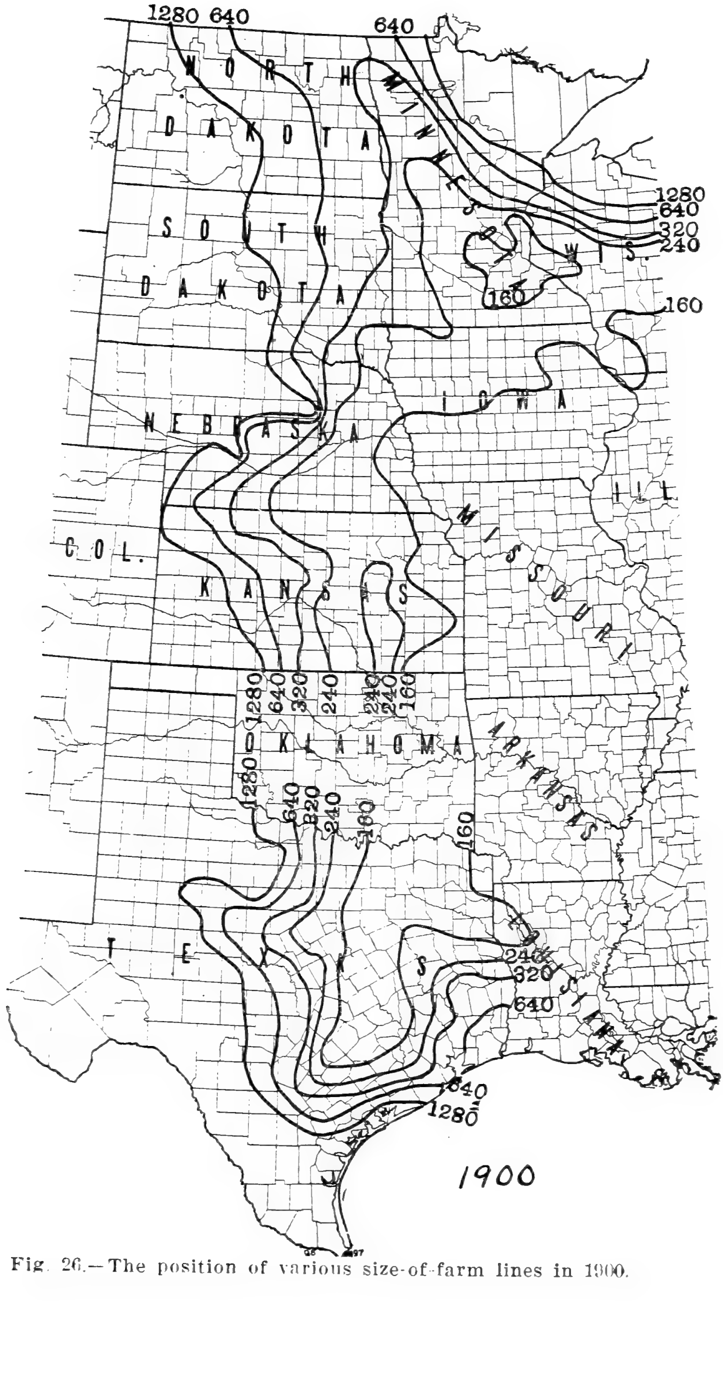

Fig. 26.—The position of various size-of-farm lines in 1900.

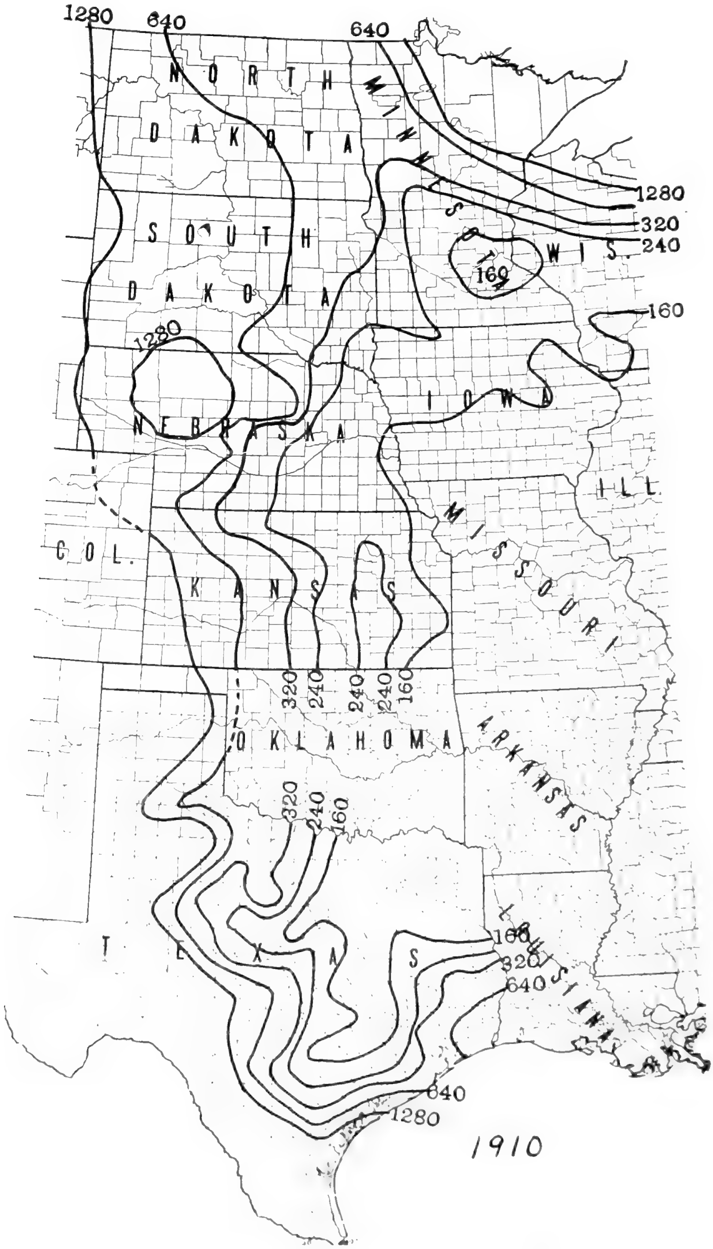

Fig. 27.—The position of various size of farm lines in 1910.

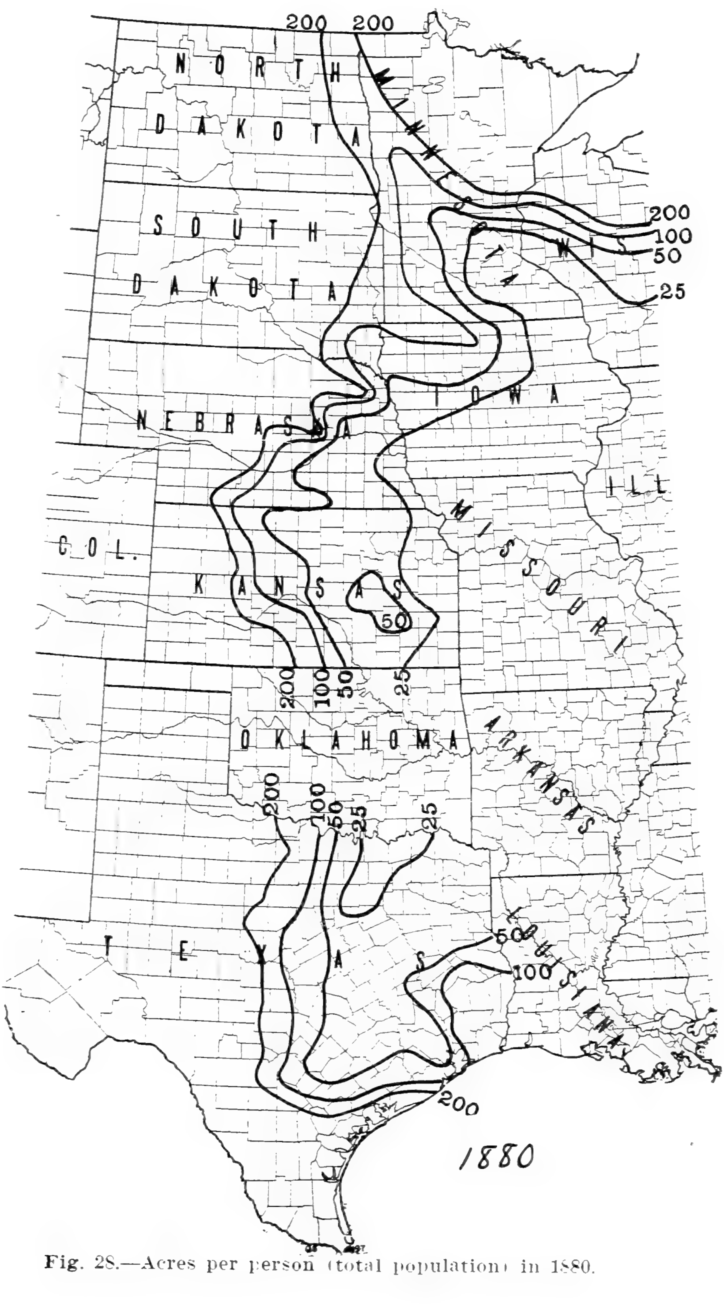

Fig. 28.—Acres per person (total population) in 1880.

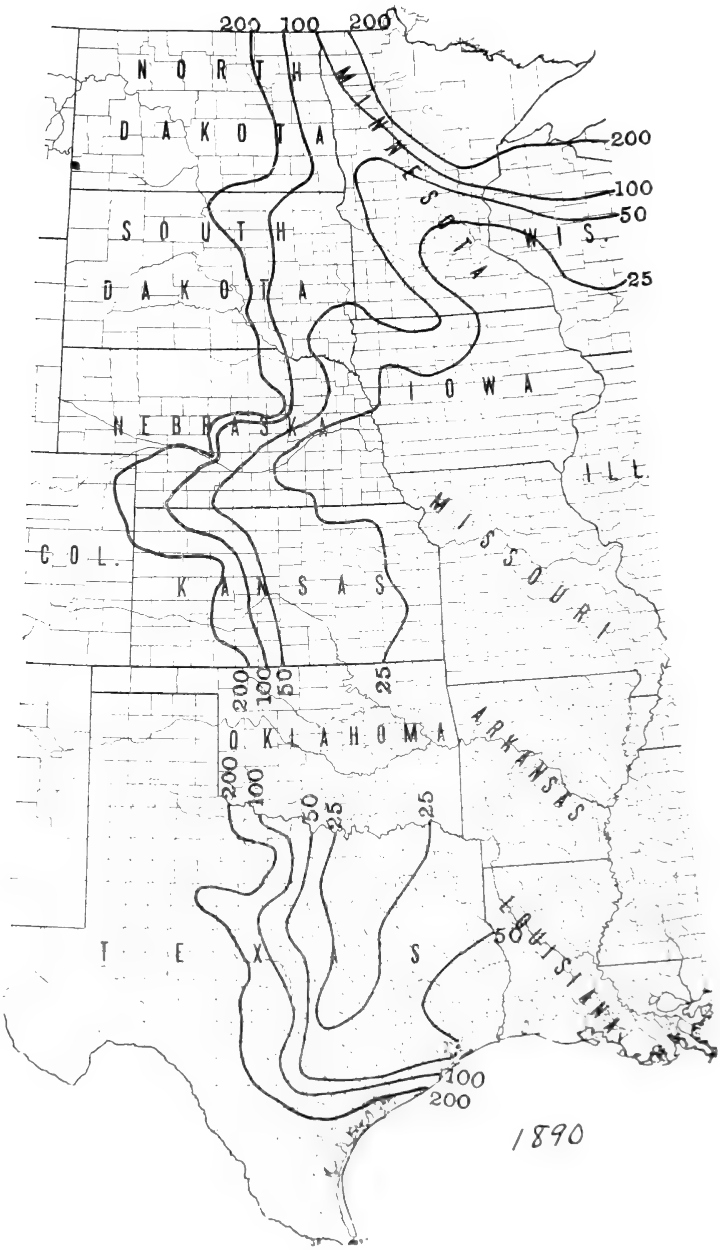

Fig. 29.—Acres per person (total population) in 1890.

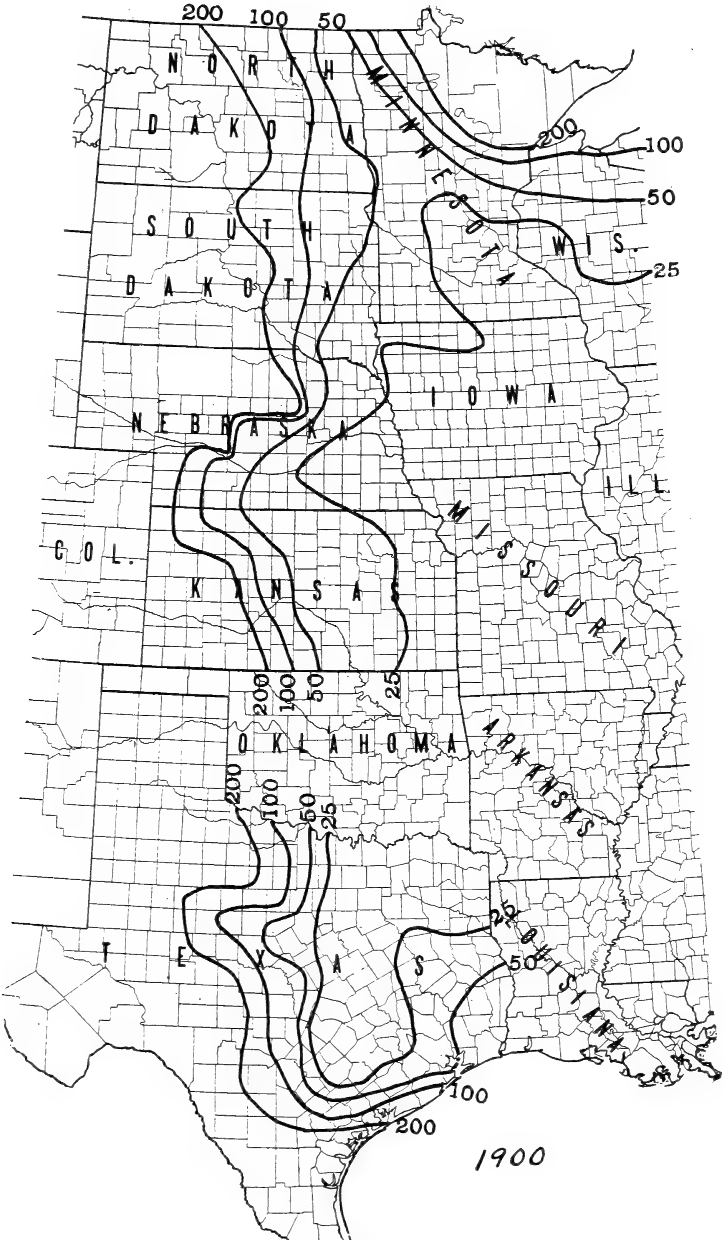

Fig. 30.—Acres per person (total population) in 1900.

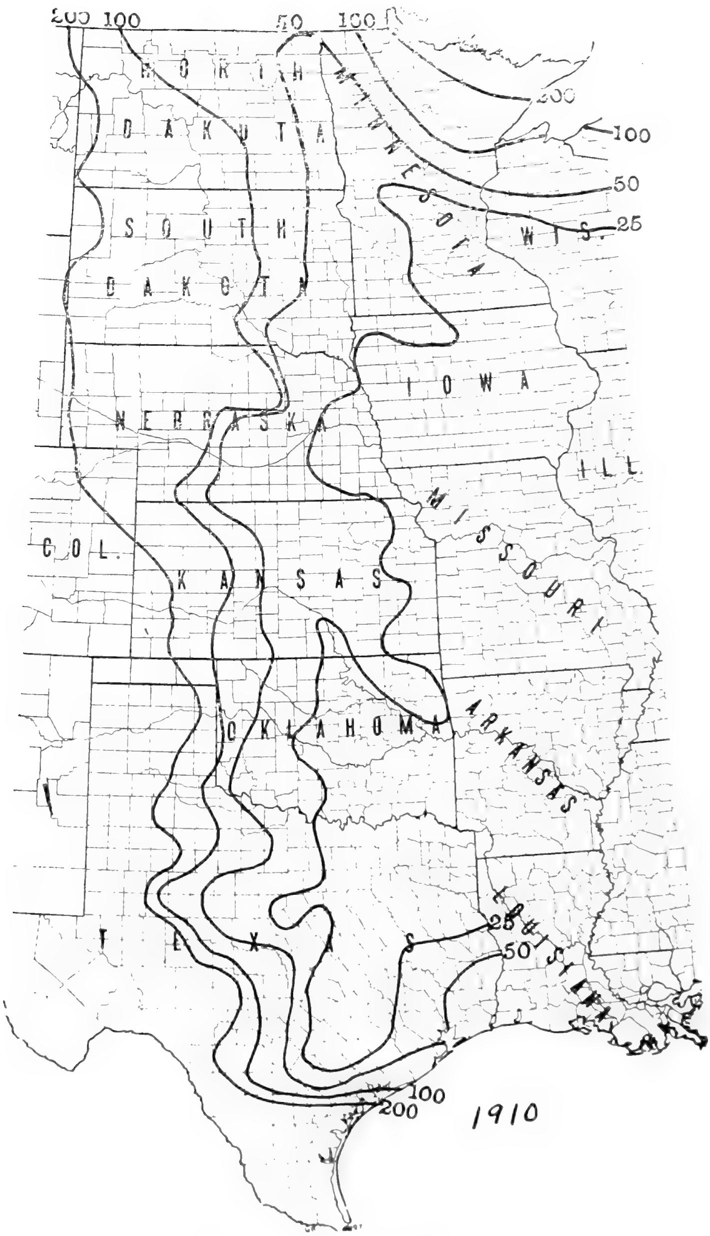

Fig. 31. Acres per person (total population) in 1910.

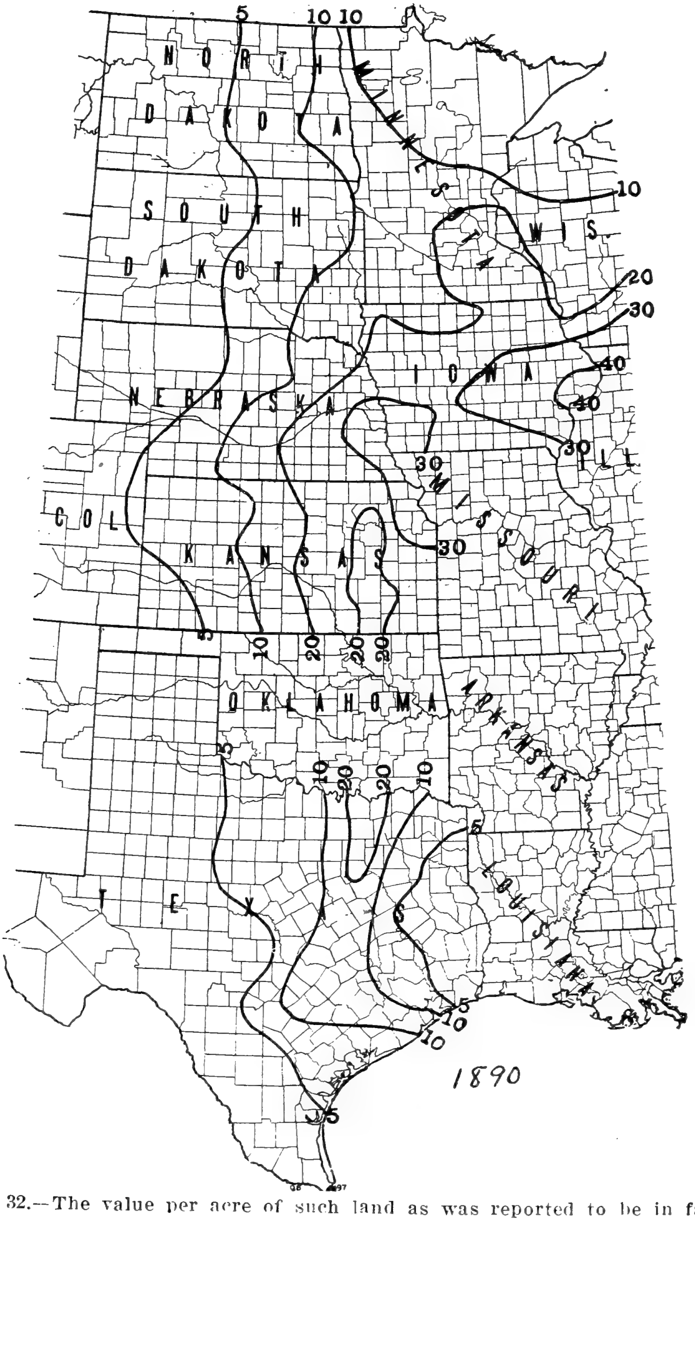

Fig. 32.--The value per acre of such land as was reported to be in farms in 1890.

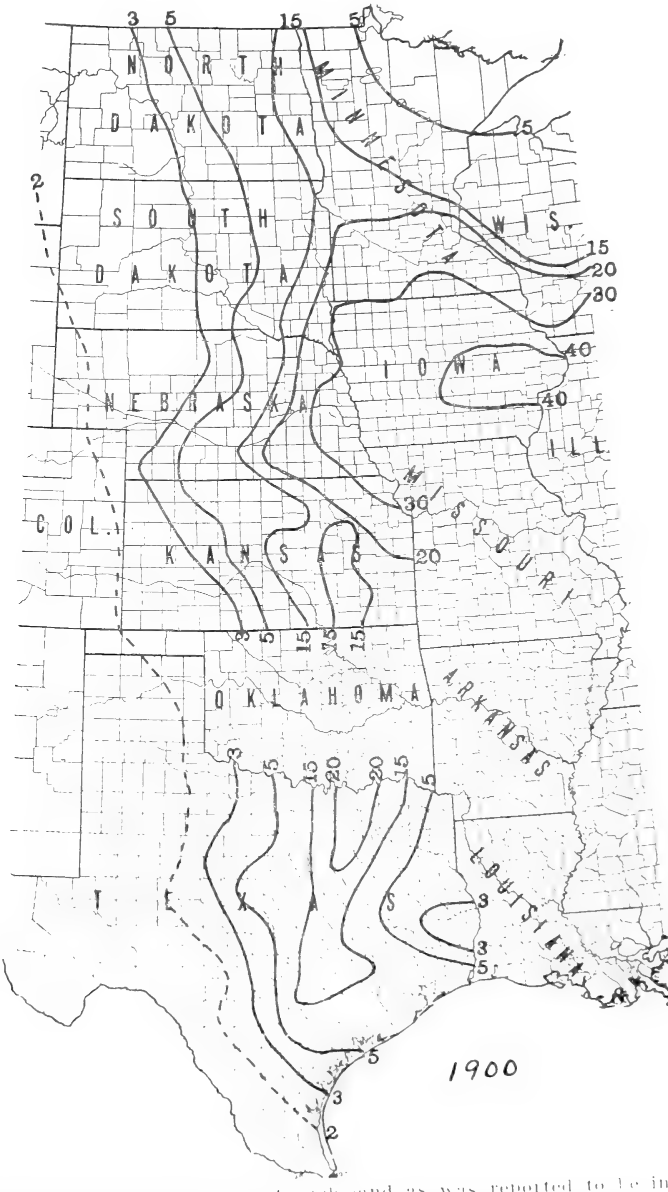

Fig. 33. The value per acre of such land as was reported to be in farms in 1900.

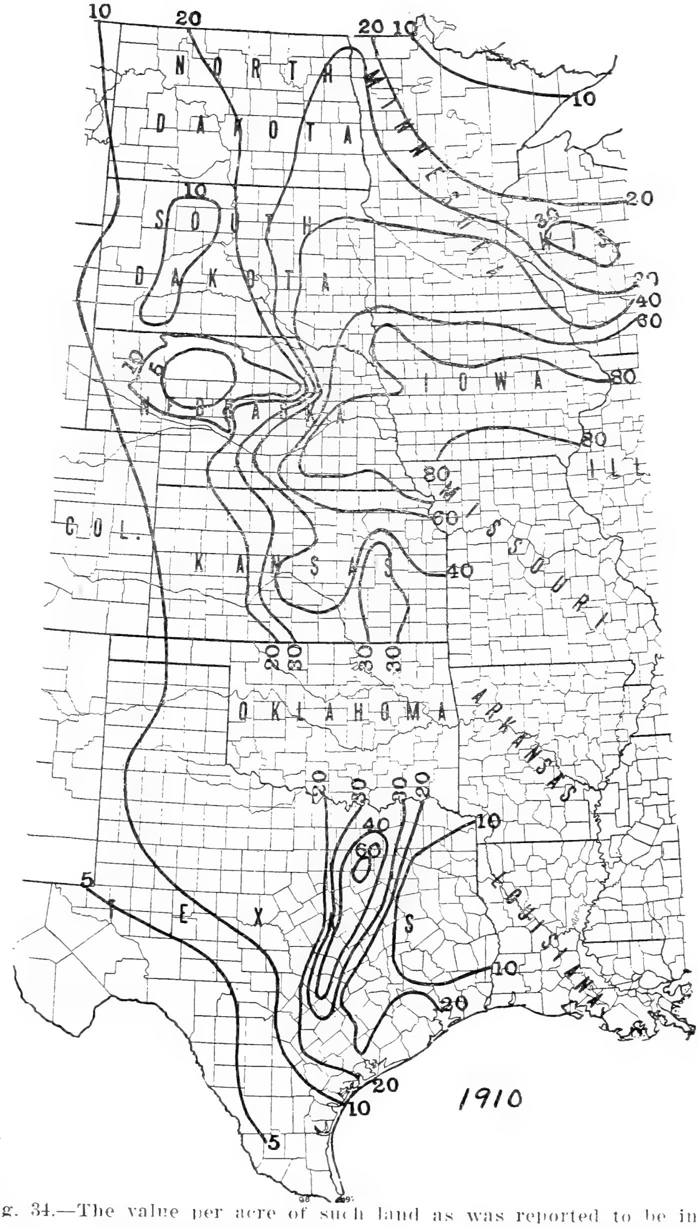

Fig. 34.—The value per acre of such land as was reported to be in farms in 1910.

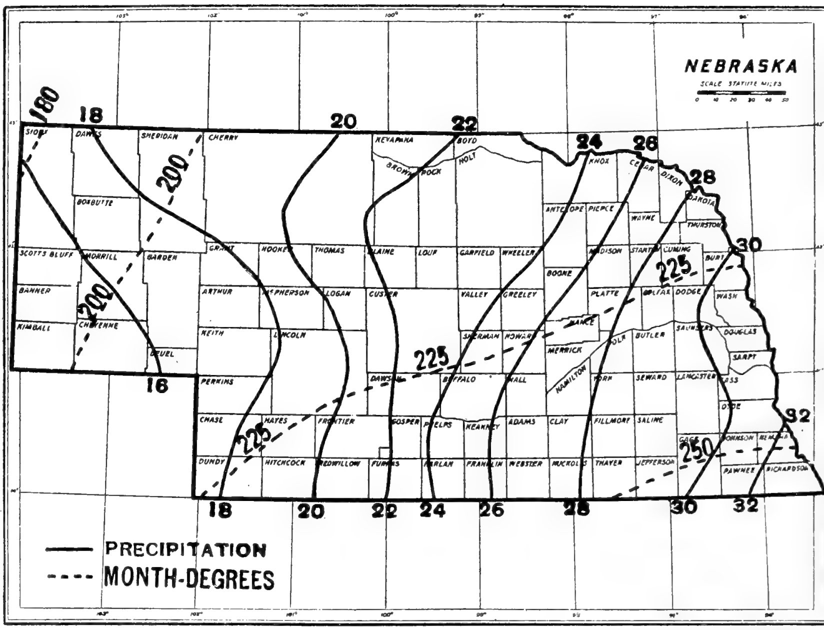

Fig. 35.—The average annual precipitation and month-degree in Nebraska.

FARM TYPES IN NEBRASKA

BOUNDARIES OF TYPE AREAS

The boundaries of type areas in Nebraska are to a large extent determined by heat, rainfall, and soil. To map the principal areas of the State having a fairly uniform type of farming, crop lines are used to register heat effects as slightly modified by rainfall and other factors, while size-of-farm lines are used to register rainfall effects as slightly modified by heat and other factors. In one case, that of the Sand Hills, soil is used independently to determine the outer boundaries of two types.

A key to all boundary lines is shown in figure 36. It will be observed that in general the northern and southern boundaries of type areas are determined by the type of annual cropping, and the eastern and western boundaries by the size of farm. The data used in determining these lines were se cured from the Thirteenth Census. The Fourteenth Census

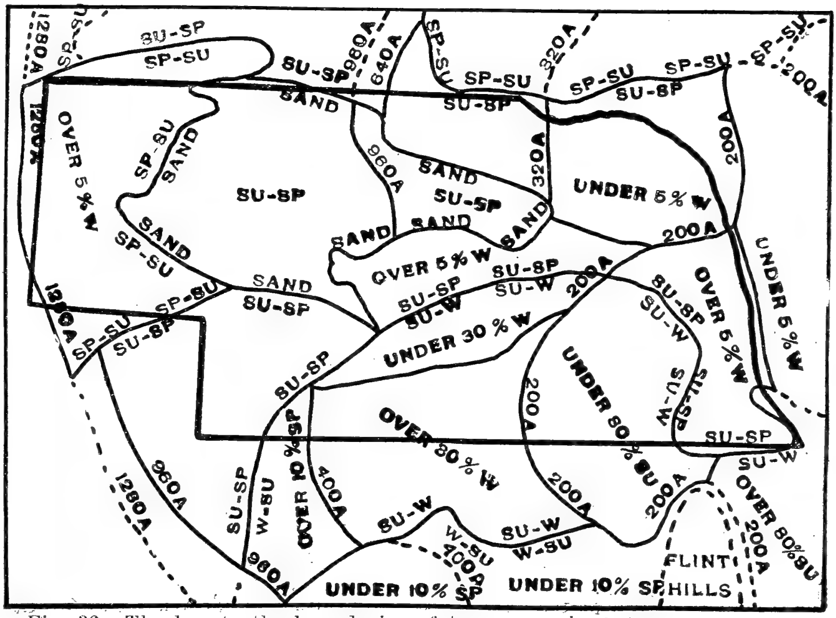

Fig. 36.—The key to the boundaries of type areas in Nebraska as determined for the year 1909.

no doubt will show the need of redrawing nearly all lines aside from those determined by the Sand Hills. For example, it would not be surprising to find that the small island of winter-summer cropping in south-central Nebraska had grown larger, that the summer-winter type was covering more of the southeastern counties, and that certain size-of-farm lines had moved a little farther west.

For the crop year 1909 Nebraska has been divided into twelve type areas. The three northwestern areas are named according to the regions they occupy. All other areas bear county names. (See Fig. 37.) To one who is familiar with the State, county names serve to characterize and locate an area almost as well as regional names. If it had been possible, however, regional names would have been given to all areas.

THE DETERMINATION OF FARM TYPES

The average type of farm for each type area was calculated from the county agricultural data of the census. Since

the organization of the census data would not permit the use of the entire area of land within a given set of boundary lines, it was necessary to choose a representative group of counties to serve as a basis for farm types.* To determine farm types, each item of county agricultural data was tabulated according to the representative groups of counties and then totaled and reduced to an average farm basis. While the total area of land was reduced to an average farm basis by using the number of all farms as a divisor, the total number of live stock and similar items were reduced by using the number of farms reporting domestic animals. This avoided at least a part of the error that would result from distributing field crops, live stock, and other items to very small farms not belonging to the general type. Table 4 brings out the fact that in most cases the difference between the number of all farms and the number of farms reporting domestic animals is relatively small.

The relative standing of winter, spring, and summer annuals indicated by the crop boundaries of type areas is very accurately shown by the average figures derived from the representative groups of counties. (See Figs. 36 and 37.) Both the boundary lines and the figures indicate that the High Plains area belongs to the spring-summer type of annual cropping, that the Western Sand Hills, Eastern Sand Hills,

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*Boyd Area—Boyd, Holt, and Kayapaha Counties.

Buffalo Area—Buffalo, Dawson, Howard, Merrick, Nance, and Sherman Counties.

Cass Area—Cass, Dodge, Johnson, Otoe, Pawnee, Saunders, and Washington Counties.

Chase Area—Chase, Dundy, and Hayes Counties, in Nebraska; Phillips and Yuma Counties in Colorado; Cheyenne County in Kansas.

Custer Area—Boone, Custer, Greeley, and Valley Counties.

Eastern Sand Hill Area—Blaine, Brown, Garfield, Loup, Rock, and Wheeler Counties.

Harlan Area—Harlan, Franklin, Frontier, Furnas, Gosper, Kearney, and Phelps Counties in Nebraska; Graham, Mitchell, Norton, Phillips and Smith Counties in Kansas.

High Plains Area—Banner, Box Butte, Cheyenne, Dawes, Kimball and Sioux Counties.

Hichcock Area—Hitchcock County in Nebraska; Logan, Rawlins, Sheridan and Thomas Counties in Kansas.

Thayer Area—Clay, Butler, Fillmore, Hamilton, Jefferson, Nuckolls, Polk, Saline, Seward, Thayer, and York Counties in Nebraska; Clay, Marshall, Republic, and Washington Counties in Kansas.

Wayne Area—Cedar, Dakota, Dixon, Cuming, Knox, Madison, Pierce, Stanton, and Wayne Counties in Nebraska; Plymouth County in Iowa; Clay, Union and Yankton Counties in South Dakota.

Western Sand Hill Area—Cherry, Hooker, McPherson, and Thomas Counties

TABLE 4.—*The number of all farms compared with the number reporting domestic animals.*

Type area	Approximate acreage of the counties chosen to represent an area	Number of all farms (1910) in the counties chosen	Number of farms (1910) reporting domestic animals
Boyd	2,369,920	4,007	3,955
Buffalo	2,542,720	9,777	9,588
Cass	2,314,240	13,521	13,297
Chase	4,231,040	5,093	4,915
Custer	2,829,440	8,194	8,097
E. Sand Hills	2,994,560	3,486	3,382
Harlan	5,521,280	19,839	19,331
High Plains	4,753,280	4,203	3,988
Hitchcock	3,091,840	4,588	4,410
Thayer	5,959,680	32,323	31,833
Wayne	4,747,987	20,743	20,435
W. Sand Hills	5,818,240	3,266	2,993

Boyd, Chase, Custer, Wayne, and Cass areas belong to the summer-spring type; that the Buffalo, Harlan, and Thayer areas belong to the summer-winter type; and the Hitchcock area to the winter-summer type. The key to boundary lines (Fig. 36) shows that the Wayne area is separated from the Custer area by a line following 5 per cent winter annuals. The figures determined from county groups indicate 2 per cent winter annuals in the Wayne area and 10 per cent winter annuals in the Custer area.

The relation that exists between the size-of-farm boundaries and the average size of farm determined for county groups can be seen on comparing figure 36 with figure 38. The average size of farm determined for a group of counties in no case exactly agrees with the average indicated by the size-of-farm lines. This is in part due to the fact that the size of farm does not change at a uniform rate from one line to another.

Each type area outlined holds a wide range of farm conditions. This is particularly true of western areas. For example, there is not a great deal of difference between lowland and upland farms in the eastern part of the State, but in western areas lowland farms that are either naturally or artificially irrigated resemble in many ways eastern farms

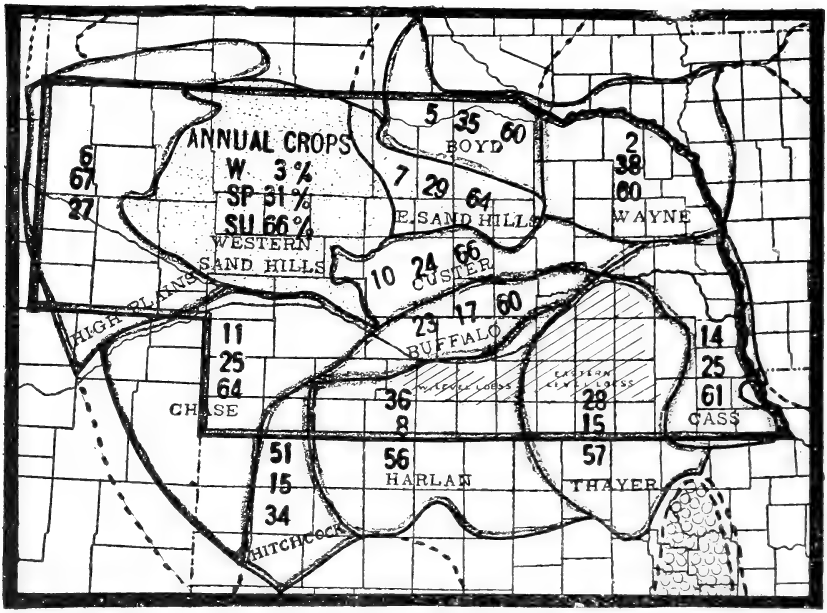

Fig. 37.—The relative importance of winter, spring, and summer annuals in the various type areas of Nebraska. (1909)

more closely than they do dry upland western farms. These and similar irregularities make it impossible to describe a type of farm that will fit all conditions within a given area. The numerical descriptions of farm types which follow apply more to farming on nonirrigated upland than they do to farming on bottom land and irrigated upland.

FARM TYPES GROUPED FOR THE PURPOSE OF STUDY

The effects of heat upon the twelve farm types can be most accurately studied when the High Plains, Western Sand Hills, Eastern Sand Hills, and Boyd types are looked upon as northern, the Chase, Buffalo, Custer, and Wayne types as central, and the Hitchcock, Harlan, Thayer, and Cass types as southern. Rainfall effects can be most accurately studied by comparing the Boyd, Wayne, and Cass types with the High Plains, Chase, and Hitchcock types respectively.

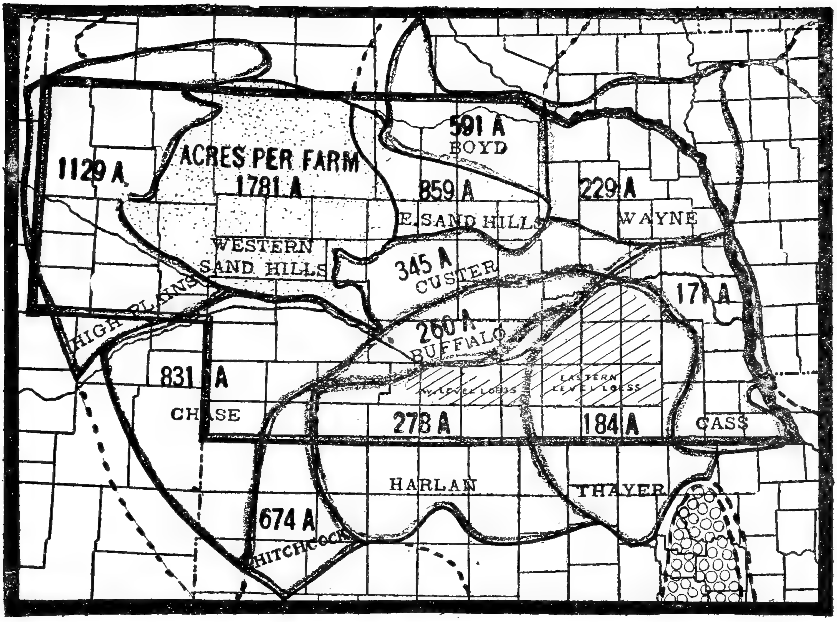

Fig. 38.—The average size of farm in the various type areas of Nebraska. (1909)

THE PRINCIPAL USES OF FARM LAND

Nearly all of the land in a farm can be classed as either cultivated land, wild hay land, or pasture and waste. In this study the cultivated land together with the wild hay land will be spoken of as the crop area. The difference between the total farm area and the crop area is assumed to be the area occupied by the farmstead, pasture, roads, and waste. Since the land occupied by lots, roads, and waste is often used more as pasture than as crop land it will not be far wrong to treat all of the farm area aside from crop land as simply pasture.

THE ACREAGE AND YIELD OF CROPS

The acreage of the various crops grown on a given type of farm varies less from year to year than either the yield per acre or the total yield per farm. While yields per acre in any given area vary greatly from season to season, there is a tendency for the yields in all areas to vary in harmony with one

another. This is in part explained by the fact that effective changes in weather during the crop season often affect areas as large or even larger than the State.

The last column in the following group of tables usually expresses the yield per acre in terms of percentage. Wherever this is done, the yield per acre on the Cass type of farm is used as a base, or 100 per cent. These percentage figures picture the normal standing of one area relative to another only in so far as yields in 1909 had the same percentage variation from normal.

TABLE 5.—*Corn per farm in 1909.*

Type area	Acres per farm	Bushels per acre	Bushels per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	11.3	15.9	180	58
Western Sand Hills	23.4	15.6	364	57
Eastern Sand Hills	35.9	22.8	818	83
Boyd	50.6	24.0	1,215	87
Southwest to Northeast				
Chase	64.5	12.7	819	46
Buffalo	61.0	22.6	1,378	82
Custer	68.8	25.4	1,748	92
Wayne	68.0	36.8	2,500	133
Southwest to Southeast				
Hitchcock	48.7	9.6	468	35
Harlan	66.4	12.3	816	45
Thayer	59.3	18.2	1,079	66
Cass	59.8	27.6	1,652	100

TABLE 6.—*Coarse forage (largely corn and "cane") in 1909.*

Type area	Acres per farm	Tons per acre	Tons per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	.90	1.64	1.48	61
Western Sand Hills	.51	1.76	.90	66
Eastern Sand Hills	.35	2.51	.88	94
Boyd	.53	2.58	1.37	97
Southwest to Northeast				
Chase	7.89	1.60	12.62	60
Buffalo	1.13	1.99	2.25	75
Custer	.52	2.48	1.29	93
Wayne	.22	3.00	.66	112
Southwest to Southeast				
Hitchcock	12.82	1.52	19.52	57
Harlan	3.68	1.77	6.51	66
Thayer	.45	2.51	1.13	94
Cass	.18	2.67	.48	100

TABLE 7.—*Wheat per farm in 1909.*

Notice that on "hard land" the production of wheat per farm is greatest where the yields are lowest.

Type area	Acres of winter wheat per farm	Acres of spring wheat per farm	Bushels of all wheat per acre	Bushels of all wheat per farm	Index to yields, Cass = 100%
Northwest to					
High Plains	1.2	14.5	10.9	172	58
North Central					
W. Sand Hills	.3	1.7	8.0	16	43
E. Sand Hills	1.6	1.3	13.4	39	71
Boyd	1.7	4.2	10.5	62	56
Southwest to Northeast					
Chase	12.7	15.5	11.4	320	61
Buffalo	24.4	.8	18.3	462	97
Custer	10.6	1.0	19.3	224	103
Wayne	1.9	5.7	14.2	108	76
Southwest to Southeast					
Hitchcock	99.2	4.9	6.4	667	34
Harlan	45.6	.4	10.9	501	58
Thayer	30.2	.3	15.7	480	84
Case	13.2	3.4	18.8	312	100

TABLE 8.—*Oats per farm in 1909.*

Type area	Acres per farm	Bushels per acre	Bushels per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	12.6	20.2	255	83
Western Sand Hills	5.9	15.4	91	63
Eastern Sand Hills	10.4	20.4	212	84
Boyd	21.3	20.0	427	82
Southwest to Northeast				
Chase	3.7	20.5	76	84
Buffalo	16.1	17.0	274	70
Custer	21.5	16.3	351	67
Wayne	35.1	25.1	880	103
Southwest to Southeast				
Hitchcock	4.2	18.6	78	76
Harlan	8.0	20.8	166	85
Thayer	15.3	24.0	368	98
Cass	20.7	24.4	506	100

TABLE 9.—*Rye per farm in 1909.*

Type area	Acres per farm	Bushels per acre	Bushels per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	1.97	11.7	23	82
Western Sand Hills	.82	9.8	8	69
Eastern Sand Hills	2.45	9.8	24	69
Boyd	2.31	9.5	22	67
Southwest to Northeast				
Chase	.85	9.4	8	66
Buffalo	.36	11.1	4	78
Custer	.47	10.6	5	75
Wayne	.22	10.9	2	77
Southwest to Southeast				
Hitchcock	.48	7.5	4	53
Harlan	.22	9.1	2	64
Thayer	.04	11.0	4	77
Cass	.07	14.2	1	100

TABLE 10.—*Barley per farm in 1909.*

Type area	Acres per farm	Bushels per acre	Bushels per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	1.25	17.6	22	83
Western Sand Hills	.17	15.2	3	72
Eastern Sand Hills	.24	14.9	4	70
Boyd	.47	18.4	9	87
Southwest to Northeast				
Chase	8.07	17.6	142	83
Buffalo	.22	15.6	3	74
Custer	.85	14.1	12	66
Wayne	2.07	18.8	39	89
Southwest to Southeast				
Hitchcock	19.00	13.7	260	65
Harlan	.30	13.1	4	62
Thayer	.10	20.4	2	96
Cass	.17	21.2	4	100

TABLE 11.—*Potatoes per farm in 1909.*

Type area	Acres per farm	Bushels per acre	Bushels per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	3.5	54	188	61
Western Sand Hills	1.4	50	70	57
Eastern Sand Hills	1.3	74	96	84
Boyd	.7	69	47	78
Southwest to Northeast				
Chase	.6	50	30	57
Buffalo	.6	62	37	70
Custer	.6	72	43	82
Wayne	.7	79	55	90
Southwest to Southeast				
Hitchcock	.5	50	25	57
Harlan	.6	50	30	57
Thayer	.5	78	39	89
Cass	.6	88	53	100

TABLE 12.—*Millet per farm in 1909.*

Type area	Acres per farm	Tons per acre	Tons per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	1.90	1.16	2.20	59
Western Sand Hills	.49	1.22	.60	62
Eastern Sand Hills	.62	1.61	1.00	82
Boyd	.77	1.64	1.26	84
Southwest to Northeast				
Chase	3.70	1.18	4.36	60
Buffalo	.72	1.63	1.17	83
Custer	.94	1.65	1.55	84
Wayne	.55	2.18	1.20	111
Southwest to Southeast				
Hitchcock	2.56	1.29	3.31	66
Harlan	1.97	1.50	2.96	77
Thayer	.65	1.85	1.20	94
Cass	.25	1.96	.49	100

TABLE 13.—*Alfalfa per farm in 1909.*

Type area	Acres per farm	Tons per acre	Tons per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	4.30	2.07	8.90	73
Western Sand Hills	1.15	2.06	2.37	73
Eastern Sand Hills	2.05	1.91	3.91	67
Boyd	3.50	1.47	5.16	52
Southwest to Northeast				
Chase	1.75	2.05	3.58	72
Buffalo	11.64	2.19	25.50	77
Custer	12.30	1.87	23.00	66
Wayne	2.00	2.65	5.30	93
Southwest to Southeast				
Hitchcock	5.05	2.02	10.18	71
Harlan	10 15	1.69	17.06	60
Thayer	6.18	2.36	14.61	83
Cass	1.59	2.84	4.52	100

TABLE 14.—*Timothy and clover per farm in 1909.*

Type area	Acres per farm	Tons per acre	Tons per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	.03	2.00	.06	130
Western Sand Hills	.35	1.69	.59	110
Eastern Sand Hills	.98	1.30	1.27	84
Boyd	2.27	1.33	3.03	86
Southwest to Northeast				
Chase	....	....	....	....
Buffalo	.49	1.31	.64	85
Custer	.54	1.31	.71	85
Wayne	6.03	1.65	9.98	107
Southwest to Southeast				
Hitchcock	....	....	....	....
Harlan	.02	1.00	.02	65
Thayer	2.49	1.33	3.30	86
Cass	5.27	1.54	8.12	100

TABLE 15.—*Wild hay per farm in 1909.*

Type area	Acres per farm	Tons per acre	Tons per farm	Index to yields, Cass = 100%
Northwest to North Central				
High Plains	40.7	.65	26.4	42
Western Sand Hills	145.0	.82	119.0	54
Eastern Sand Hills	88.4	.88	77.5	58
Boyd	86.1	1.03	88.5	67
Southwest to Northeast				
Chase	10.9	.82	8.9	54
Buffalo	19.4	1.15	22.3	75
Custer	24.5	.92	22.5	60
Wayne	16.2	1.48	23.9	97
Southwest to Southeast				
Hitchcock	4.7	.98	4.6	64
Harlan	9.9	.88	8.7	58
Thayer	7.2	1.17	8.4	76
Cass	8.8	1.53	13.5	100

TABLE 16.—*Apple trees per farm and also the approximate per cent of all land covered with woods (1909).*

Type area	Apple trees per farm	Bushels of apples per tree	Bushels of apples per farm	Approximate per cent of all land covered with woods
Northwest to North Central				
High Plains	42	.40	.17	1.90
Western Sand Hills	1.08	.03	.03	.40
Eastern Sand Hills	5.64	.51	2.88	1.07
Boyd	9.76	.94	9.16	2.92
Southwest to Northeast				
Chase	1.27	.21	.27	.31
Buffalo	9.55	.96	9.20	1.68
Custer	11.40	.59	6.70	.99
Wayne	14.70	1.53	22.50	2.35
Southwest to Southeast				
Hitchcock	1.90	.20	.38	.49
Harlan	9.60	.45	4.33	1.34
Thayer	35.40	.77	27.40	2.68
Cass	55.30	1.40	77.40	4.20

THE HARVEST VALUE OF CROPS

The census reports the value of crops grown on crop land, but does not report the value of pasture growth. If the value of plant growth on one type of farm is to be compared with the value of plant growth on another type of farm, pasture must be included. Furthermore, the value assigned to pasture growth must be comparable with the value assigned to crop growth. Since the census gives to crops what might be termed a harvest value (Table 17), it will be necessary to compute a similar value for pasture (Table 18). In computing the so-called harvest value of pasture it was assumed that the acreage of pasture per farm multiplied by the average value of all land would give a fair index to the total value of pasture land, and that 5 per cent of the total would not be far from the actual harvest value of pasture per farm. If it had been possible, however, the average value of pasture land would have been used in the place of the average value of all land and 7½ per cent (three times what is approximately the actual rent) would have been used in the place of 5 per cent.

TABLE 17.—*The harvest value per farm of all crops grown on crop land in 1909.*

Type area	Value of all crops grown on crop land, 1909	Per cent from grains, vegetables, fruits, etc.	Per cent from hay and other rough feeds	Value of crops per acre of crop land	Percentage index to the value of crops per acre
Northwest to North Central					
High Plains	$744	61	39	$7.45	54
W. Sand Hills	732	44	56	3.95	29
E. Sand Hills	911	68	32	6.00	43
Boyd	1,185	71	29	6.50	47
Southwest to Northeast					
Chase	1,004	86	14	7.50	54
Buffalo	1,582	81	19	11.45	83
Custer	1,544	82	18	10.65	77
Wayne	1,939	87	13	13.70	99
Southwest to Southeast					
Hitchcock	1,261	86	14	6.15	45
Harlan	1,199	83	17	8.05	58
Thayer	1,718	88	12	13.80	100
Cass	1,612	88	12	13.80	100

TABLE 18.—*The estimated harvest value of pasture per farm in 1909.*

Type area	Approximate value per acre of all land	Acres of pasture per farm	Index to total value of pasture Col. 1xCol. 2.	Estimated harvest value of pasture (5% of the values in Col. 3)
	(1)	(2)	(3)	(4)
Northwest to North Central				
High Plains	$9.89	1029	$10,180	$509
W. Sand Hills	4.66	1596	7,437	372
E. Sand Hills	10.10	707	7,141	357
Boyd	22.73	409	9,297	465
Southwest to Northwest				
Chase	11.06	698	7,720	386
Buffalo	49.10	122	5,990	300
Custer	34.83	200	6,966	348
Wayne	69.50	87	6,046	302
Southwest to Southeast				
Hitchcock	15.67	469	7,349	368
Harlan	35.40	130	4,602	230
Thayer	74.60	60	4,476	224
Cass	85.90	54	4,639	232

TABLE 19.—*Value of crop and pasture growth per farm in 1909.*

Type area	Estimated harvest value of pasture	Harvest value of pasture per acre of pasture land	Value of crops plus the estimated value of pasture	Value of crops and pasture per acre of the farm area	Per cent of the value of land
Northwest to North Central					
High Plains	$509	$ .49	$1253	$1.11	11
W. Sand Hills	372	.23	1104	.62	13
E. Sand Hills	357	.50	1268	1.48	15
Boyd	465	1.14	1650	2.79	12
Southwest to Northeast					
Chase	386	.55	1390	1.67	15
Buffalo	300	2.46	1882	7.24	15
Custer	348	1.74	1892	5.48	16
Wayne	302	3.51	2241	9.79	14
Southwest to Southeast					
Hitchcock	368	.78	1629	2.42	15
Harlan	230	1.77	1429	5.13	14
Thayer	224	3.73	1942	10.55	14
Cass	232	4.30	1844	10.78	13

CROP INDEXES

In 1909 the Hitchcock type of farm produced on 48.70 acres as many bushels of corn as the Cass type of farm produced on 16.94 acres.* According to this ratio 100 acres of corn in the Hitchcock area would have produced as much as 34.77 acres in the Cass area. In Farm Management this statement would commonly read—the crop index of corn land in the Hitchcock area is 34.77 per cent of that in the Cass area.

Table 20 illustrates the method of determining the crop index of the cultivated land, the crop land, and the farm as a whole. It will be observed that according to this calculation

*Representative counties in the Cass area—Cass, Dodge, Johnson, Otoe, Pawnee, Saunders, and Washington Counties produced 21,977,553 bushels of corn on 795,719 acres. Acres per farm reporting domestic animals, 59.82. Bushels per farm, 1,652. Yield per acre, 27.62 bushels. (1909)

Representative counties in Hitchcock area—Hitchcock county in Nebraska and Logan, Rawlins, Sheridan, and Thomas Counties in Kansas produced 2,062,805 bushels of corn on 214,529 acres. Acres per farm reporting domestic animals, 48.70. Bushels per farm, 468. Yield per acre, 9.61 bushels. (1909)

200.12 acres of cultivated land in the Hitchcock area were about equivalent in 1909 to 83.19 acres of cultivated land in the Cass area. It is readily seen that this is a ratio of 100 acres to 41.6 acres, and that the crop index of the Hitchcock cultivated land must therefore be 41.6 per cent.

Wild hay occupies such a small acreage on the Hitchcock type of farm that there is little difference between the area of cultivated land and the area of crop land. This being true, it is not surprising to find that the crop index of crop land measures very nearly the same as the crop index of the cultivated land.

The value of land is here assumed to be in harmony with the normal yield of native pasture grasses. (Field studies in many parts of the State indicate that this is in general true.) If the inventory of live stock and the use of pasture in one area could have been directly compared with the inventory of live stock and the use of pasture in another area, the carrying capacity of the land rather than its value would have been used as an index to pasture yields. When pasture land is added to crop land the index to yields is decidedly lowered. This is especially true of western areas where the greatest difference exists between the quantity of plant growth on the land selected for crops and the quantity of plant growth on the land left for pasture.

TABLE 20.—*The calculation of Hitchcock crop indexes using the Cass type of farm as a basis.*

(1) Kinds of crops	(2) Acreage of various crops grown on the Hitchcock type of farm.	(3) Total yield from the acreage of various crops grown on the Hitchcock type of farm.	(4) Yield per acre of various crops grown on the Cass type of farm.	(5) Acreage of the Cass type of farm equivalent in 1909 to a given acreage of the Hitchcock type of farm. (Figures in Col. 3 divided by corresponding figures in Col. 4.)	(6 Hitchcock crop indexes (figures in Col. 5 divided by corresponding figures in Col. 2) Cass = 100%
Rye	$0.48 A	4 bu.	14.22 bu.	0.28 A	
Winter wheat	99.20 A	(All wheat)	(All wheat)	(All wheat)	
Spring wheat	4.88 A	667 bu.	18.81 bu.	35.45 A	
Oats	4.16 A	78 bu.	24.43 bu.	3.19 A	
Barley	19.00 A	260 bu.	21.23 bu.	12.25 A	
Emmer	1.09 A	21 bu.	16.83 bu.	1.25 A	
Grains cut green	0.19 A	0.18 T	1.37 T	.13 A	
Potatoes	0.50 A	25 bu.	88.00 bu.	.28 A	
Corn	48.70 A	468 bu	27.62 bu.	16.94 A	
Millet	2.56 A	3.31 T	1.96 T	1.69 A	
Kafir	0.97 A	8.80 bu.	16.17 bu.	.54 A	
Cane	0.21 A	0.28 T	3.45 T	.08 T	
Coarse Forage	12.82 A	19.25 T	2.67 T	7.32 A	
Timothy	....	....	1.52 T	....	
Timothy and clover	....	....	1.54 T	....	
Clocer	0.20 A	0.20 T	1.49 T	.13 A	
Alfalfa	5.05 A	10.18 T	2.84 T	3.58 A	
Other tame grasses	0.11 A	0.11 T	1.47 T	.08 A	
Small fruit	....	....	....	....	
Total	200.12 A			83.19 A	cultivated land Index 41.6%
Wild hay	4.66 A	4.6 T	1.53 T	2.99 A	
Total	204.78 A			86.18 A	Crop land index 42.1%
Pasture	469.00 A			85.50 A*	
Total	673.78 A			171.68 A	Crop and pasture land Index 25.5 %

*The acreage of pasture in the Hitchcock type of farm (469.00A) is to be equivalent acreage of pasture in the Cass type of farm (85.50A) as the price of land in the Cass area ($85.90) is to the price of land in the Hitchcock area ($15.67.)

TABLE 21.—*What were approximately equivalent acreages in 1909.*

Type area	Cultivated land: Actual acreage	Cultivated land: Equivalent acreage of Cass land in 1909*	Crop land: Actual acreage	Crop land: Equivalent acreage of Cass land in 1909*	Crops and pasture: Actual acreage	Crops and pasture: Equivalent acreage of Cass land in 1909*
High Plains	59	40.4	100	57.7	1129	169.5
W. Sand Hills	40	23.8	185	101.5	1781	188.2
E. Sand Hills	63	51.0	152	102.0	859	184.4
Boyd	96	78.9	182	136.5	591	244.5
Southwest to Northeast						
Chase	122	67.9	133	73.8	831	163.5
Buffalo	119	98.8	138	113.1	260	183.0
Custer	121	102.9	145	117.1	345	198.0
Wayne	126	148.0	142	163.5	229	233.5
Southwest to Southeast						
Hitchcock	200	83.2	205	86.2	674	171.7
Harlan	138	74.1	148	79.9	278	133.9
Thayer	117	89.8	124	95.1	184	147.0
Cass (the base)	108	108.0	117	117.0	171	171.0

*The value of land cannot be judged from such equivalent acreages as appear in this table. In some cases the so-called equivalent acreage of Cass land is made up largely of pasture and wild hay and in other cases it contains a large share of cultivated land. For example, the 1781-acre farm in the Western Sand Hills appears to be equivalent to 188 acres of **average** land in the Cass area. This is 17 acres greater than the average Cass farm. When one stops to consider, however, that the equivalent acreage of Cass land (188 acres) is made up of 23 acres of good cultivated land in the Cass area, 78 acres of Cass wild hay land, and 87 acres of Cass pasture land, it is readily seen that it is not equivalent to an equal acreage of average land in the Cass area. Furthermore, in studying the equivalent acreages given above it must be borne in mind that it is more expensive to harvest a given quantity of a crop where yields are low than where yields are high and also that where farms are large the distance to market is greatly increased.

TABLE 22.—*Crop indexes in 1909.**

Type area	Crop index of cultivated land. Cass=100%	Crop index of crop land. Cass=100%	Crop index of the farm area. Cass=100%
Northwest to North Central			
High Plains	68.5%	57.7%	15.0%
Western Sand Hills	59.5	54.8	10.6
Eastern Sand Hills	80.9	67.1	21.5
Boyd	82.2	75.0	41.4
Southwest to Northeast			
Chase	55.6	55.4	19.7
Buffalo	83.0	82.0	70.4
Custer	85.0	80.8	57.4
Wayne	117.4	115.0	102.0
Southwest to Southeast			
Hitchcock	41.6	42.1	25.5
Harlan	53.7	54.0	48.2
Thayer	76.7	76.7	79.9
Cass	100.0	100.0	100.0

*The equivalent acreage divided by the actual acreage.

TABLE 23.—*Cows on hand April 15, 1910, and the production of milk and butter for the calendar year 1909.*

Type area	Head of dairy cows per farm	Head of other cows per farm	Gallons of milk produced per farm*	Pounds of butter per farm
Northwest to North Central				
High Plains	3.7	12.7	837	145
Western Sand Hills	3.7	27.3	789	140
Eastern Sand Hills	5.6	8.2	1113	150
Boyd	6.7	9.2	1423	190
Southwest to Northeast				
Chase	3.8	5.7	725	137
Buffalo	5.5	4.8	1660	184
Custer	5.1	6.6	1270	191
Wayne	5.7	4.9	1440	246
Southwest to Southeast				
Hitchcock	4.8	2.7	1014	142
Harlan	4.7	3.3	1160	192
Thayer	4.3	2.2	1149	184
Cass	4.7	3.2	1337	241

*"Milk produced represents all the milk produced during the year (except that fed directly, without being skimmed, to calves, pigs, etc., on the farm), even tho a portion or all of such milk is converted into butter or cheese and reported under these items."

TABLE 24.—*Cattle other than cows on hand April 15, 1910.*

Type area	Yearling heifers per farm	Spring calves per farm	Yearling steers per farm	Other steers and bulls per farm
Northwest to North Central				
High Plains	4.2	3.7	3.9	8.4
Western Sand Hills	8.0	6.9	8.1	16.4
Eastern Sand Hills	3.6	4.0	4.0	6.0
Boyd	4.6	5.3	6.0	9.3
Southwest to Northeast				
Chase	2.4	2.4	2.4	4.1
Buffalo	3.0	3.1	2.8	4.0
Custer	3.3	3.4	3.5	4.4
Wayne	3.1	3.1	3.0	4.8
Southwest to Southeast				
Hitchcock	2.0	2.3	1.8	2.4
Harlan	2.3	2.5	2.1	1.9
Thayer	1.8	2.0	1.6	1.8
Cass	2.3	2.3	2.0	2.0

TABLE 25.—*Total number and value of cattle on hand April 15, 1910, and the number sold or slaughtered during the calendar year 1909.*

Type area	Total number of cattle per farm	Value of cattle per farm	Number of cattle sold or slaughtered
Northwest to North Central			
High Plains	36.6	$939	14.8
Western Sand Hills	70.4	1910	24.3
Eastern Sand Hills	31.4	756	11.3
Boyd	41.1	1000	15.4
Southwest to Northeast			
Chase	20.8	475	8.6
Buffalo	23.2	584	11.6
Custer	26.3	647	12.3
Wayne	24.6	623	11.5
Southwest to Southeast			
Hitchcock	16.0	351	6.0
Harlan	16.8	393	7.8
Thayer	13.7	337	6.5
Cass	16.5	407	7.5

TABLE 26.—*Horses and mules on hand April 15, 1910.*

Type area	Mature horses per farm	Yearling horses per farm	Mature mules per farm	Yearling mules per farm
Northwest to North Central				
High Plains	9.6	1.7	0.2	0.1
Western Sand Hills	10.8	1.7	0.3	0.1
Eastern Sand Hills	6.6	0.8	0.4	0.1
Boyd	7.6	0.9	0.5	0.1
Southwest to Northeast				
Chase	7.9	1.0	0.7	0.2
Buffalo	6.9	0.8	0.4	0.1
Custer	7.7	1.0	0.4	0.1
Wayne	6.8	0.6	0.3	0.0
Southwest to Southeast				
Hitchcock	7.6	1.0	0.7	0.2
Harlan	6.6	0.8	0.8	0.2
Thayer	5.8	0.6	0.7	0.1
Cass	5.8	0.5	0.6	0.1

TABLE 27.—*The total number and value of horses and mules and also the approximate number and value of work animals (1910).*

Type area	Head of all horses and mules per farm	Total value of horses and mules per farm	Approximate number of work animals per farm*	Approximate value of work animals per farm*
Northwest to North Central				
High Plains	11.6	$1022	8.0	$760
Western Sand Hills	12.9	1058	9.3	809
Eastern Sand Hills	7.9	723	6.1	586
Boyd	9.1	940	7.1	767
Southwest to Northeast				
Chase	9.8	971	7.4	770
Buffalo	8.2	993	6.4	742
Custer	9.2	971	7.0	777
Wayne	7.7	923	6.5	795
Southwest to Southeast				
Hitchcock	9.5	942	7.1	738
Harlan	8.4	.895	6.4	710
Thayer	7.2	846	5.8	650
Cass	7.0	807	5.8	677

*The total number of horses and mules minus twice the number of yearling horses and mules leaves approximately the number of work animals.

†The total value of horses and mules divided by the total number of horse units and mule units (one mature animal or two yearlings) gives approximately the value of one work animal. This value per head multiplied by the number of work animals gives the approximate value of all work animals.

TABLE 28.—*Hogs and corn per farm.*

Type area	Mature hogs per farm, April 15, 1910	Hogs sold or slaughtered during year 1909	Bushels of corn raised per farm 1909	Bushels of corn per hog unit*
Northwest to North Central				
High Plains	2.5	3.9	180	202
Western Sand Hills	3.2	8.1	364	251
Eastern Sand Hills	7.3	10.2	818	330
Boyd	14.4	17.5	1215	262
Southwest to Northeast				
Chase	9.9	12.5	819	253
Buffalo	18.9	26.7	1378	214
Custer	22.6	29.4	1748	231
Wayne	25.9	28.8	2500	310
Southwest to Southeast				
Hitchcock	6.4	11.2	468	195
Harlan	13.9	23.5	816	159
Thayer	13.6	21.8	1079	220
Cass	15.4	21.8	1652	316

*Mature hogs on hand April 15, 1910, plus one-half of the hogs sold or slaughtered during the year 1909 and this sum divided by five gives the approximate number of hog units.

TABLE 29.—*Poultry raised and eggs produced in 1909.*

Type area	Number of poultry raised per farm	Eggs produced per farm Dozen	Eggs sold Dozen	Approximate number of eggs used in setting* Dozen	Approximate number of eggs used in the home Dozen
Northwest to North Central					
High Plains	53	238	131	9	98
Western Sand Hills	54	137	43	9	85
Eastern Sand Hills	66	163	73	11	79
Boyd	88	252	138	15	99
Southwest to					
Chase	78	283	175	13	95
Buffalo	111	357	211	18	128
Custer	95	275	136	16	123
Wayne	113	409	261	19	129
Southwest to Southeast					
Hitchcock	97	332	220	16	96
Harlan	130	439	303	21	115
Thayer	142	434	285	23	126
Cass	131	387	234	22	131

*Two eggs allowed for each head of poultry raised.

TABLE 30.—*Approximate number of productive animal units per farm.**

Type area	Cattle units per farm	Hog units per farm	Sheep units per farm	Poultry units per farm	Productive horse units per farm
Northwest to North Central					
High Plains	28.85	0.89	1.60	0.53	2.70
Western Sand Hills	55.45	1.45	0.60	0.54	2.70
Eastern Sand Hills	23.60	2.48	0.19	0.66	1.35
Boyd	30.50	4.63	0.10	0.88	1.50
Southwest to Northeast					
Chase	16.00	3.23	0.06	0.78	1.80
Buffalo	17.20	6.45	0.60	1.11	1.35
Custer	19.50	7.56	0.19	0.95	1.65
Wayne	18.45	8.06	0.19	1.13	0.96
Southwest to Southeast					
Hitchcock	11.80	2.40	0.30	0.97	1.80
Harlan	12.10	5.13	0.10	1.30	1.50
Thayer	10.00	4.90	0.10	1.42	1.05
Cass	12.05	5.22	0.11	1.31	0.87

*All live stock aside from work animals are here classed as productive. In calculating the number of animal units, the number of spring calves, spring colts, spring pigs, etc., are omitted. Of other animals, one cow, two yearling heifers, one horse, two yearling colts, five hogs, seven sheep, or one hundred head of poultry, are used as one animal unit.

TABLE 31.—*The approximate total number of animal units per farm in 1909.*

Type area	Productive animal units	Units of work stock	Total number of animal units
Northwest to North Central			
High Plains	34.6	8.0	42.6
Western Sand Hills	60.7	9.3	70.0
Eastern Sand Hills	28.3	6.1	34.4
Boyd	37.6	7.1	44.7
Southwest to Northeast			
Chase	21.9	7.4	29.3
Buffalo	26.7	6.4	33.1
Custer	29.8	7.0	36.8
Wayne	28.8	6.5	35.3
Southwest to Southeast			
Hitchcock	17.3	7.1	24.4
Harlan	20.1	6.4	26.5
Thayer	17.5	5.8	23.3
Cass	19.6	5.8	25.4

TABLE 32.—*The approximate division of live-stock capital between productive stock and work animals.*

Type area	Value of all live stock per farm	Approximate value of work stock	Approximate value of productive live stock	Approximate per capital that was cent of live-stock in productive live stock
Northwest to North Central				
High Plains	$2084	$760	$1324	64%
Western Sand Hills	3090	809	2281	74
Eastern Sand Hills	1624	586	1038	64
Boyd	2188	767	1421	65
Southwest to Northeast				
Chase	1616	770	846	52
Buffalo	1849	742	1107	60
Custer	1998	777	1221	61
Wayne	1984	795	1189	60
Southwest to Southeast				
Hitchcock	1429	738	691	48
Harlan	1543	710	824	54
Thayer	1440	650	790	55
Cass	1510	677	833	55

TABLE 33.—*Receipts from live stock in 1909.*

Type area	Receipts from the sale of animals	Value of animals slaughtered	Value of dairy products*	Value of poultry and eggs produced	Value of wool produced	Total receipts from live stock
Northwest to North Central						
High Plains	$636	$43	$54	$66	$20	$819
Western Sand Hills	934	32	48	43	6	1063
Eastern Sand Hills	600	27	67	50	1	745
Boyd	808	39	92	70	1	1010
Southwest to Northeast						
Chase	442	32	41	77	1	593
Buffalo	997	42	98	102	4	1243
Custer	1012	38	78	79	1	1208
Wayne	1030	49	95	109	1	1284
Southwest to Southeast						
Hitchcock	462	41	62	88	0	653
Harlan	718	39	74	117	1	949
Thayer	684	42	73	129	1	929
Cass	693	45	84	129	1	952

*The census omits here the milk and cream used in the home.

TABLE 34.—*Labor hired in 1909.**

Type area	Per cent of farms reporting labor hired in 1909	Cash spent per farms reporting labor hired	Value of board furnished	Wages and board per farm reporting labor hired
Northwest to North Central				
High Plains	38.7	$192	$64	$256
Western Sand Hills	37.5	319	82	401
Eastern Sand Hills	38.1	173	46	219
Boyd	43.6	181	54	235
Southwest to Northeast				
Chase	37.8	162	54	216
Buffalo	47.0	184	59	243
Custer	44.0	179	61	240
Wayne	55.0	202	68	270
Southwest to Southeast				
Hitchcock	60.0	182	41	223
Harlan	54.0	215	41	256
Thayer	54.0	149	47	196
Cass	49.0	180	52	232

*According to field studies the average farm in Nebraska requires about 20 months of man labor per year. As a rule the operator contributes 12 months, his boys or other members of his family the equivalent of 5 months, and hired labor about 3 months.

TABLE 35.—*A calculation of the value per acre of such land as was not reported in the census. (1909).*

Type area	Acres of land per farm reported in the census (1909)	Per cent of land reported	Value per acre of such land as was reported	Approximate acreage of land per farm not reported	Calculated value per acre of such land as was not reported*
Northwest to North Central					
High Plains	746	66.0	$11.18	383 A	$7.38
Western Sand Hills	859	48.0	6.38	922	3.06
Eastern Sand Hills	629	73.0	10.88	230	7.94
Boyd	549	77.5	23.10	42	17.90
Southwest to Northeast					
Chase	502	60.4	13.12	329	7.92
Buffalo	240	92.3	49.40	20	45.60
Custer	316	91.3	35.10	29	32.06
Wayne	213	93.0	69.90	16	65.01
Southwest to Southeast					
Hitchcock	531	79.0	16.40	143	12.95
Harlan	264	95.0	35.50	14	33.72
Thayer	178	96.4	74.80	6	72.10
Cass	164	96.0	86.10	7	82.66

*The value of land not reported is here made to bear the same relation to the value of land reported as the per cent of land reported bears to 100 per cent of all land.

TABLE 36.—*Approximate value of land per farm in 1910.*

Type area	Total value of the land reported in the census	Calculated total value of the land not reported	Approximate total value of all land	Approximate value per acre of all land
Northwest to North Central				
High Plains	$8,340	$2,826	$11,166	$9 89
Western Sand Hills	5.480	2.821	8,301	4.66
Eastern Sand Hills	6,844	1,826	8,670	10.10
Boyd	12,682	752	13,434	22.73
Southwest to Northeast				
Chase	6.586	2,606	9,192	11.06
Buffalo	11,856	.912	12,768	49.10
Custer	11,092	.929	12,021	34.83
Wayne	14,889	1,040	15,929	69.50
Southwest to Southeast				
Harlan	9,372	472	9,844	35.40
Hitchcock	8,708	1,852	10,560	15.67
Thayer	13,314	433	13,747	74.60
Cass	14.120	578	14,698	85.90

TABLE 37.—*Capital in live stock, machinery, buildings, and land (1910).*

Type area	Value of live stock per farm	Value of machinery per farm	Value of buildings per farm	Approximate value of land per farm
Northwest to North Central				
High Plains	$2,084	$290	$1,015	$11,166
Western Sand Hills	3,090	215	802	8,301
Eastern Sand Hills	1,624	235	918	8,670
Boyd	2,188	334	1,287	13,434
Southwest to Northwest				
Chase	1,616	294	885	9,192
Buffalo	1,849	366	1,558	12,768
Custer	1,998	327	1,419	12,021
Wayne	1,984	423	1,982	15,929
Southwest to Southeast				
Hitchcock	1,429	350	938	10,560
Harlan	1,534	306	1,251	9,844
Thayer	1,440	358	1,591	13,747
Cass	1,510	362	1,887	14,698

TABLE 38.—*The approximate amount of capital per farm in 1910.*

Type area	Total capital per farm	Total capital per acre
Northwest to North Central		
High Plains	$14,555	$12.90
Western Sand Hills	12,408	7.00
Eastern Sand Hills	11,447	13.30
Boyd	17,243	29.20
Southwest to Northeast		
Chase	11,987	14.40
Buffalo	16,541	63.60
Custer	15,765	45.60
Wayne	20,318	88.70
Southwest to Southeast		
Hitchcock	13,277	19.70
Harlan	12,935	46.50
Thayer	17,136	93.10
Cass	18,457	108.00

TABLE 39.—*The nativity of farm operators.*

Type area	Per cent native	Per cent foreign born
Northwest to North Central		
High Plains	78	22
Western Sand Hills	85	15
Eastern Sand Hills	87	13
Boyd	72	28
Southeast to Northeast		
Chase	86	14
Buffalo	70	30
Custer	85	15
Wayne	61	39
Southwest to Southeast		
Hitchcock	81	19
Harlan	81	19
Thayer	73	27
Cass	69	31

TABLE 40.—*Degree of ownership.*

Type area	Per cent of farms operated by strictly owners	Per cent of farms operated by part owners	Per cent of farms operated by tenants	Per cent of farms operated by managers
Northwest to North Central				
High Plains	75	15	9	1
Western Sand Hills	83	13	3	1
Eastern Sand Hills	68	19	12	1
Boyd	49	23	27	1
Southwest to Northeast				
Chase	55	28	17	0
Buffalo	45	15	39	1
Custer	45	17	38	1
Wayne	44	13	42	1
Southwest to Southeast				
Hitchcock	35	38	26	1
Harlan	38	22	40	0
Thayer	39	15	45	1
Cass	42	13	44	1

TABLE 41.—*The forms of tenancy.*

Type area	Per cent of tenants classed as share and share-cash	Per cent classed as strictly cash tenants	Per cent not classified
Northwest to North Central			
High Plains	48%	27%	25%
Western Sand Hills	52	24	24
Eastern Sand Hills	65	16	19
Boyd	70	23	7
Southwest to Northeast			
Chase	82	5	13
Buffalo	80	13	7
Custer	77	13	10
Wayne	50	45	5
Southwest to Southeast			
Hitchcock	85	4	11
Harlan	89	6	5
Thayer	85	11	4
Cass	60	35	5

TABLE 42.—*A calculation of the average distance from farm to town.*

Type area	Average number of sections of land per town*	Calculated diameter of trade territory†	Calculated average distance to town*†
Northwest to North Central	Sq. Miles	Miles	Miles
High Plains	825	32	11.4
Western Sand Hills	1514	44	15.5
Eastern Sand Hills	1170	39	13.6
Boyd	284	19	6.7
Southwest to Northeast			
Chase	444	24	8.4
Buffalo	120	12	4.4
Custer	201	16	5.6
Wayne	108	12	4.1
Southwest to Southeast			
Hitchcock	439	24	8.3
Harlan	154	14	5.0
Thayer	81	10	3.6
Cass	59	9	3.1

*Sections of land in the counties chosen to represent a type area divided by the number of towns contained.

†The square root of the quantity obtained by dividing the average number of sections per town by 0.7845.

*†The square root of the quantity obtained by dividing one-half of the average number of sections per town by 3.1416.

[11-13-'18—3M]